



A4S

CFO LEADERSHIP NETWORK

ESSENTIAL GUIDE TO VALUATIONS AND CLIMATE CHANGE

A framework to assess the impact of climate change
on business valuations



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This guide is aimed at finance professionals who are responsible for performing business valuations. It sets out a framework to bring climate change risks and opportunities into business and asset valuation calculations.

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We would like to thank all of the project team members who contributed to the framework.



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INTRODUCTION FROM THE A4S CFO LEADERSHIP NETWORK

Climate change presents a material risk to businesses and the economy. The impact of climate change is, therefore, an increasingly important consideration when making investment decisions and determining the value of businesses. For us at OTPP (Ontario Teachers' Pension Plan), a substantial portion of our investments is in private assets, including direct investments in private equity, infrastructure, natural resources, and real estate. And therefore, business valuations are particularly important to us. We must be able to assess accurately the value of each of these private investments, both for financial reporting purposes and to inform our investment decisions. Climate change and business valuations are inextricably linked. When determining the value of a business, one must consider all the risks and opportunities, of which climate change is one.

In 2019 we started thinking more deeply about how to reflect the impact of growing climate change risks in our valuations and did a scan for guidance available from valuation organizations around the globe and found that there was very little. This lack of guidance highlighted the need for a valuation framework that would facilitate a consistent approach to factoring in climate change risks into valuation and investment analyses.

This led me to approach A4S with the idea of creating some guidance that investors, valuers and other interested parties could use to help them include consideration of climate change issues in business valuations. It was on this basis that "The Impact of Climate Change on Business Valuations" working group was formed, bringing together a number of members of the CFO Leadership

Network in Canada as well as drawing on leading practice from elsewhere.

Factoring climate change into valuations is in its infancy. Through this guide we hope to inform the discussion among the valuation, accounting and regulatory communities to encourage moving this forward into accepted practice. By doing so, we would expect more robust disclosures in corporate reporting and a greater oversight by boards on this topic.

We hope that the guide will become widely referenced and used by valuers and investors in their valuations and decision-making processes.

**DAVID MCGRAW,
CHIEF FINANCIAL OFFICER,
ONTARIO TEACHERS'
PENSION PLAN**

"When determining the value of a business, one must consider all the risks and opportunities, of which climate change is one."

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EXECUTIVE SUMMARY

The impact of climate change is an increasingly important consideration when making investment underwriting decisions and determining the value of businesses. Climate change risks and opportunities have an impact across the financial system and require involvement from investors, regulators, and insurers to ensure these factors are appropriately considered.

Climate change and business valuations are inextricably linked. When determining the value of a business, one must consider all the risks and opportunities, of which climate change is one. It can, however, be difficult to assess climate change risks and opportunities if there is a lack of consistency in the information disclosed. This framework has been developed to provide guidance on how to incorporate climate change risks and opportunities into valuations by using the level of information currently available.

The framework outlines the following key steps:

- 1. Identify** the company's key value drivers.
- 2. Assess** source of climate change risks and opportunities.
- 3. Filter** the identified climate change risks and opportunities for those more significant and more likely to occur.
- 4. Integrate** the key risks and opportunities into the chosen valuation approach.
- 5. Triangulate** the identified risks and opportunities to the market and iterate as required.

The framework and steps are not meant to be prescriptive but to act as an aid in how to incorporate these very real but often ignored factors into valuations. Climate change is just one factor among many that need to be considered in valuations but an increasingly important one that can no longer be ignored.

“

“Factoring climate change into valuations is in its infancy. Through this guide we hope to inform the discussion among the valuation, accounting and regulatory communities to encourage moving this forward into accepted practice. By doing so, we would expect more robust disclosures in corporate reporting and a greater oversight by boards on this topic.”

**DAVID MCGRAW, CHIEF FINANCIAL OFFICER,
ONTARIO TEACHERS' PENSION PLAN AND
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WHY DID WE DEVELOP THIS FRAMEWORK?

THE DRIVERS TO ACT

The impact of climate change has become an increasingly important consideration when making investment unwrapping decisions or determining the fair value* of businesses. Throughout this document, the term “fair value” is referred to, although it is not intended to match only one particular definition. There are numerous definitions of “fair value” and this framework is intended to be broadly applicable for a wide range of various stakeholders and purposes.

In 2017, the Task Force on Climate-related Financial Disclosures (TCFD) launched a set of voluntary disclosure recommendations for use by companies when providing information to investors, lenders, and insurance underwriters about their climate-related financial risks. Although the TCFD has encouraged enhanced disclosures around the risks and opportunities associated with climate change, there is limited consistency across the investment and valuation community as to how this information should be factored into business valuations. There is little guidance published by accounting or valuation standard-setting bodies in this regard. This lack of guidance highlights the need for a valuation framework that will facilitate a consistent approach to factoring climate change risks into valuation analyses.

Global accounting and regulatory standards are among the few standards that are borderless and not necessarily impacted by political motivations. This universality creates an opportunity for the alignment of the investment community across the globe. As these standards evolve to recognize that climate change impacts should be measured in accordance with business valuation principles, boards of directors will be required to (or, at least, be more apt to) ensure their oversight includes climate change impacts. There may also be general liability risks in connection with fiduciary duty. Investors will require a greater degree of oversight which will shift behaviour, sharpen the focus and increase attention paid to the implications of climate change for business decision making. With knowledge of how climate change can impact value, companies will likely accelerate activities to mitigate adverse consequences or seek out opportunities to create value.

*Throughout this document, the term “fair value” is used. While this term has a specific definition under accounting standards, use of the term here is not intended to restrict readers to this specific definition. The definition will depend on the circumstances and perspective of the valuator, investor, or other parties. The term could be defined not only according to accounting standards but also as a broader “business value” concept from a value-in-use, risk-assessment, or market-pricing perspective. Various users of the framework may have different needs and purposes; accordingly, their definitions of value will differ. As such, the framework is intended to be broadly applicable for a wide range of various stakeholders and purposes.

FRAMEWORK AIMS

This framework has been developed to help investors and valuers incorporate climate change factors into business and asset valuations. In recent years, climate change has come to the forefront of broader environment, social and governance (ESG) considerations for companies.

The goal of this framework is to:

- **Provide a reference point for investment and valuation communities on valuation considerations as they relate to the incorporation of climate-related impacts.**
- **Act as a resource that facilitates discussion on climate change which will enable stakeholders to gather the relevant information needed to assess climate change risks and opportunities in their investment and valuation analyses.**
- **Provide stakeholders with a framework that will enable them to consider systematically the risks and opportunities associated with climate change in investment decisions and fair value determinations. (These risks and opportunities should still be viewed under core valuation principles similar to the ways in which other factors may be considered.)**

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WHAT IS CLIMATE CHANGE?

Definition: Climate change refers to long-term shifts in the earth’s weather patterns that can be caused by natural phenomena or human activity. Today, the term is commonly used to mean rising average global temperatures caused by the concentration of greenhouse gas emissions (GHG) in the atmosphere.

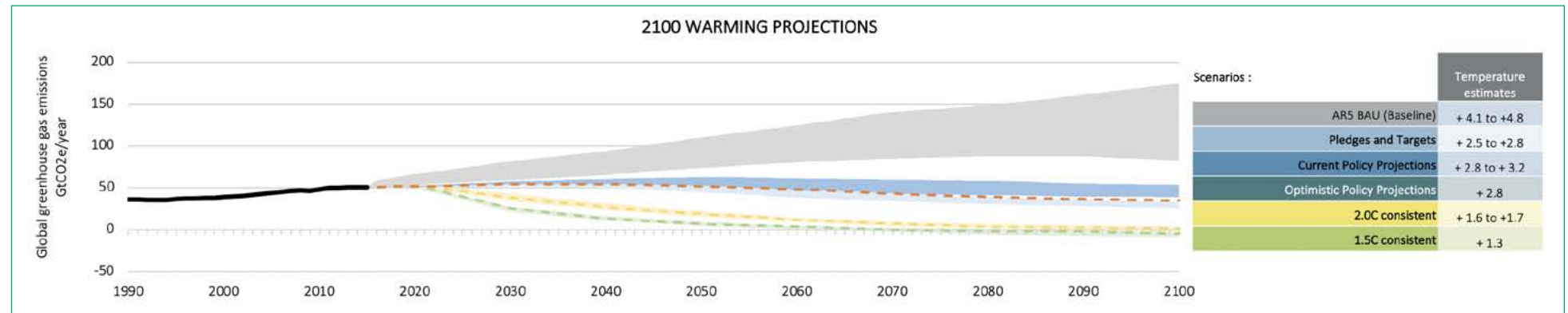
Risks created by climate change: Physical risks resulting from climate change include acute changes to the environment such as extreme heat and storms, drought, wildfires, as well as chronic impacts such as sea-level rise, desertification and changes in precipitation patterns. Climate change also gives rise to transition risks as a result of the actions needed by governments and consumers to manage or mitigate climate change. Both these risks have the potential to disrupt business operations and impact a company’s revenues, costs, risk profile and ultimately its value.

Transitioning to a low-carbon economy also comes with investment opportunities; as the world shifts from a carbon economy to a renewable one, there will be massive opportunities from investing in the transition.

Uncertainty of future outcomes and scenarios: In 2015, at the United Nations Framework Convention on Climate Change, nearly 200 nations signed the Paris Agreement which commits to “holding the increase in the global average temperature to well below 2°C above pre-industrial levels and to pursue efforts to limit the temperature increase to 1.5°C above pre-industrial levels.”

Many countries, however, have failed to put in place the policies required to achieve this. Based on the current policies in place (at the time of publication), there will likely be a 2.8°C to 3.2°C rise in average global temperatures above pre-industrial levels by 2100.¹ As shown in the graph below, the many projections for the amounts of future GHG emissions lead to different warming estimates. In addition, it should be noted that there are many uncertainties around each scenario and their related physical effects along with unknowns around the policy and technology solutions that will be put in place. These uncertainties may lead to different interpretations of the same underlying data, which could lead to a different assessment of the risks and opportunities.

The Climate Action Tracker can act as a resource for considering different degree scenarios. Please also refer to the associated Valuations and Climate Change tool, which is an Excel-based tool developed to support implementation of the guidance, where the use of various scenarios is discussed.



¹ Climate Action Tracker: Global emissions time series, October 2020

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PROACTIVELY ADDRESSING CLIMATE CHANGE AND ITS POTENTIAL IMPACT CAN LEAD TO SHAREHOLDER VALUE

Climate change risks and opportunities can impact revenues, costs and risk profiles of companies as well as investment attractiveness.² The value of a company is defined by the present value of the stream of cash flows that can be produced in the future taking into account the size of the cash flows, their timing and the risk associated with achieving them. There is inherent uncertainty as to the exact impact climate change will have on a business’s financial projections and future cash flows and how this needs to be considered in the company’s valuation.

Examples of the potential impact of actively addressing climate change



² <https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2020/03/Factoring-Climate-Risk-into-Financial-Valuation.pdf>

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Operating decisions

Climate change will have significant and lasting impacts on economic growth and prosperity. It is a defining factor in companies' long-term prospects because of its effect on cash flow assumptions, terminal values and exit values. These factors make it a business risk and a mainstream business issue.³ For many companies, climate risks are substantive financial risks because they have a direct and measurable impact on the production and distribution of their goods and services.⁴ Global efforts to reduce carbon emissions, for example, will place different levels of stress on the cash flows and valuations of businesses in different industries,⁵ depending on a company's ability to respond, shifts in consumer demand and the extent of changes in legislation.

Investment decisions

Investors are asking how they should modify their portfolios and are seeking to understand both the physical risks as well as the ways climate policy, technology and changing consumer preferences will impact prices, costs and demand across the entire economy. This concern is leading to a reassessment of risk and asset values by investors worldwide as climate change considerations become embedded in investment decisions.

Financing decisions

Climate risk is also a systemic risk. Central banks and other supervisory authorities are now considering climate change as a risk to financial stability.⁶ It also drives geopolitical risk.⁷ For example, 2019 saw unprecedented global public protests. Millions of people marched for climate action on every continent as climate change activism went mainstream. Despite this, financial markets appear to have been slow to price in the full extent of climate change. Some of the biggest risks of climate change will be social instability, mass migration and health impacts brought on by physical climate impacts.

CREATING SHAREHOLDER VALUE

Shareholder value is improved by making the right operating investment and financing decisions. Investors can create resilient, stronger and more profitable portfolios by addressing environmental risks, which can then trigger capital reallocation and asset repricing. This, in turn, offers opportunities for long-term investors such as pension funds. Companies that exhibit better environmental, social and governance (ESG) traits tend to:

- Outperform their peers (ie companies focusing on the ESG indicators most financially relevant to their industry tend to perform well)⁸
- Achieve a lower cost of capital⁹
- Minimize share price volatility¹⁰

On the other hand, a company that has an unsustainable business model or that responds weakly to climate change may face diminished returns and may even be subject to stranded-asset risk. Over time, companies and countries that do not respond to stakeholder demands and address sustainability risks may encounter growing scepticism from the markets and, in turn, be subject to a higher cost of capital.

3 https://www.osc.gov.on.ca/documents/en/Securities-Category5/csa_20190801_51-358_reporting-of-climate-change-related-risks.pdf

4 <https://www.intactcentreclimateadaptation.ca/wp-content/uploads/2020/03/Factoring-Climate-Risk-into-Financial-Valuation.pdf>

5 <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-climate-change-could-affect-corporate-valuations>

6 <https://www2.deloitte.com/us/en/insights/topics/strategy/impact-and-opportunities-of-climate-change-on-business.html>

7 <https://globalriskinstitute.org/publications/climate-risk-and-sustainable-finance-outlook-for-2020-2/>

8 Khan, Mozaffar and Serafeim, George and Yoon, Aaron S., Corporate Sustainability: First Evidence on Materiality (November 9, 2016). The Accounting Review, Vol. 91, No. 6, pp. 1697-1724

9 Damodaran, Aswath and Cornell, Bradford, Valuing ESG: Doing Good or Sounding Good? (March 20, 2020)

10 <https://yoursri.com/media-new/download/jpm-esg-how-esg-can-enhance-your-portfolio.pdf>

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CURRENT APPROACH TO CLIMATE CHANGE IN VALUATIONS

To date the **general approach to considering climate change in valuations has been qualitative in nature** and focused on identifying climate change risks, opportunities and possible mitigants. Many investors and companies consider potential climate change factors in their due diligence activities; some have begun to perform sensitivity analyses around key valuation assumptions (eg carbon pricing, financial cost of increased frequency and severity of extreme weather, renewable tax credits, etc); however, explicitly incorporating the impact of climate change has not yet become mainstream.

There are various reasons for the present lack of quantitative analysis around climate change in current business valuations, including:

- **Lack of comparable information:** Comparisons between companies are often difficult or impossible because of limited disclosure requirements, albeit this is improving with the rapid adoption of TCFD compliant reporting.
- **Limited published scenarios:** There is no suite of generally accepted integrated assumptions that can be consistently adopted by companies in their analyses.
- **Uncertainty:** There is currently no agreement as to which projections about the impact of climate change on economies, industries and the subject company may be most accurate.
- **Empirical evidence:** It is difficult to demonstrate the extent to which the market is already pricing in the risks and opportunities associated with climate change.

It is, however, only a matter of time until climate change risks and opportunities are more explicitly priced into business valuations. In fact, it is becoming evident today that companies that have high ESG ratings trade at higher multiples than their peers. This implies they may have a lower cost of capital.

Important progress toward improving corporate disclosure has been made in recent years; many organizations across the globe have been working to improve climate change disclosures in financial statements and other corporate documents (eg stand-alone ESG reports). Over time it is expected that such disclosure will continue to improve and become more widespread.

As previously mentioned, the consistent disclosure of climate change information is important to enable valuers and investors to leverage and assess the impact of climate change risk in valuations.

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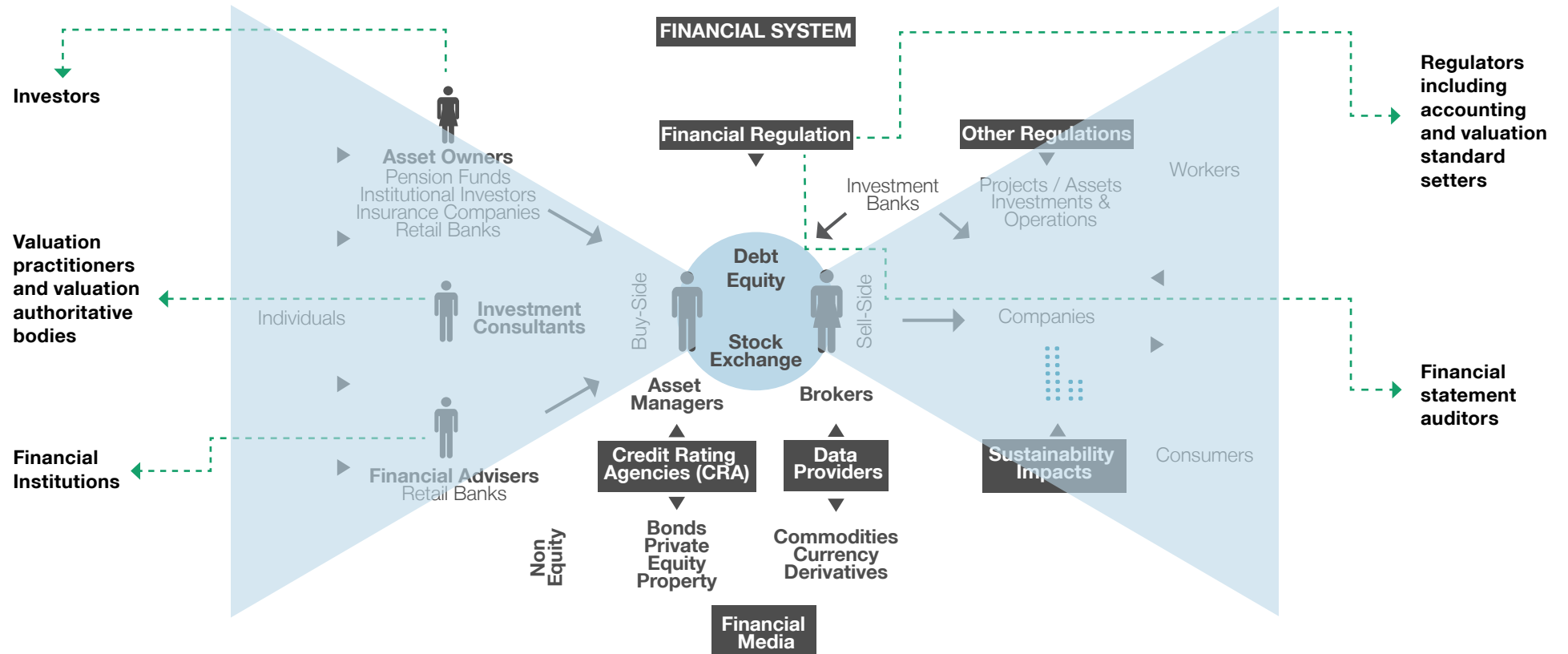
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WHO ARE THE KEY STAKEHOLDERS?

Company valuation is one of the most important factors driving investment decisions. As such, the integration of climate risk into valuations is essential in enabling finance to flow towards sustainable and away from unsustainable companies. A number of stakeholders along the investment chain play an important role in the valuation process, highlighted on the diagram below and described in more detail on the following pages.



Source: Aviva Investors, European Political Strategy Centre

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WHO ARE THE KEY STAKEHOLDERS?

VALUATION PRACTITIONERS AND VALUATION AUTHORITATIVE BODIES

Valuators are experts in determining the value of a business enterprise. By leveraging data on relevant climate change factors and analysing and factoring in impacts of climate change on future cash flows and their risk, valuers strive for valuations that reflect relevant information. The professional and informed judgement aspect of valuation is the ability to translate both financial as well as non-financial measures into value.

Various parties have attempted to estimate the impact on public company valuations from climate-related risks; some have estimated that policies designed to combat climate change could permanently slash the value of companies around the world by up to US\$2.3 trillion.¹¹ While there seems to be agreement that the effect of climate change on the valuations of many sectors and companies is likely to be profound,¹² the challenge lies in the complexity of factoring climate change risks and opportunities into valuation analyses in a consistent manner. It is particularly challenging when the risks are uncertain or viewed as “too distant” to model, there is no historical precedent or where climate data is lacking.

There could be much diversity in how climate change risks and opportunities are factored into business valuations from entity to entity, sector to sector, or investor to investor. As such, there is a real need for unified, global business valuation guidance and standards applicable to all business valuations. Consistent consideration and measurement of climate change risks, opportunities and impacts are important for more consistent valuation outcomes. This global approach to consideration of climate change risks will ultimately benefit global financial markets because it will help to drive transparency and some consistency in assessments of risks, opportunities and impacts.

INVESTORS

ESG considerations have become increasingly important to investors during investment decision making and ongoing asset management activities. Investors understand that financial metrics alone are not sufficient to assess adequately long-term value. Integration of ESG factors (including how a business impacts the environment, the health and safety of its employees, and overall good governance practices) may have an impact on the performance of a business, which in turn will improve financial results and create sustainable value. Investors have also begun publicly demanding a focus on ESG.

Over 80% of investors believe companies should address ESG considerations;¹³ in 2019 approximately 1,000 institutional investors (managing more than US\$11 trillion in assets) committed to divest from fossil fuels.¹⁴

In recent years, climate change has emerged at the forefront of ESG considerations and investors are spending more time ensuring investments are well positioned for a transition to a low-carbon economy. Inadequate management and disclosure of climate change risk is seen by investors as having the potential to significantly impact the long-term value of a business.

Understanding how climate change risks and opportunities will impact the value of investments will allow investors to assess the financial impact of these risks and opportunities from their investment thesis to a current point in time. Additionally, ongoing assessment will help investors evaluate and reallocate investment portfolios across all asset classes.

¹¹ <https://www.cnn.com/2019/12/09/economy/climate-change-company-valuations/index.html>

¹² <https://www.mckinsey.com/business-functions/strategy-and-corporate-finance/our-insights/how-climate-change-could-affect-corporate-valuations>

¹³ PwC, “Older and wiser: Is responsible investment coming of age?” Private Equity Responsible Investment Survey, 2019. Survey results are based on responses from 162 firms across 35 countries and territories.

¹⁴ Billy Nauman, “Sharp rise in number of investors dumping fossil fuel stocks,” Financial Times, September 9, 2019

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FINANCIAL INSTITUTIONS

Climate change is an important consideration for financial institutions such as banks and insurance companies since those that integrate climate change considerations into the risk assessments of their borrowers and policy holders are believed to have a lower risk profile.¹⁵ In order to assess a company's long-term financial risk, it is critical for financial institutions to consider the company's climate-related management practices and its overall sustainability. Banks are under increasing regulatory and commercial pressure to respond. For example, the European Banking Authority is establishing regulatory and supervisory standards for ESG risks and has published a multi-year sustainable finance action plan. Banks are allocating a larger portion of their capital to ESG-friendly investments such as green bond issuances, which can provide a lower cost of capital and potentially better execution as compared to traditional bonds.¹⁶

Insurance companies have experienced significant losses from the increased frequency and magnitude of natural catastrophes, which are largely considered to be a result of climate change. This has resulted in higher insurance premiums and, in some cases, no coverage in certain climate regions for companies with a greater exposure to physical climate risks. During policy renewals, insurance companies focus on understanding a company's resilience to these climate risks. Proper climate change management can help to reduce overall insurance costs.

Properly assessing and pricing climate change risks and opportunities will allow financial institutions to understand their own and their clients' significant exposure to these risks and opportunities. By understanding the exposure and valuation implications of climate change risks and opportunities, financial institutions will be able to determine better the potential impact of climate change on the value of their portfolios.

FINANCIAL STATEMENT AUDITORS

Awareness and understanding of climate change issues are key for financial statement auditors. As companies embrace the TCFD recommendations, auditors will need to understand better how climate change can create risks and / or opportunities and thus will be able to assess which risks or opportunities are material and warrant disclosure in their clients' financial statements. Auditors will become more knowledgeable about these matters as they gain a greater understanding of the companies they audit. Over time, as regulations evolve, auditors will likely play a greater role in assessing how companies have disclosed information compared to the regulations in place in their territory.

Audits of institutional and other large investors require an assessment of the appropriateness of the fair value of investments. Under the definition of fair value in IFRS® and US GAAP, auditors will need to assess the factors that market participants would consider when valuing or pricing an asset, which may include the impact of climate change as it becomes better understood and becomes a more material factor to incorporate into valuations.

Refer to **Appendix 3** for further detail on the relevance to financial reporting.

¹⁵ https://www.spglobal.com/_assets/documents/ratings/the-esg-advantage-exploring-links-to-corporate-financial-performance-april-8-2019.pdf

¹⁶ <https://www.cnn.com/2020/02/14/esg-investing-numbers-suggest-green-investing-mega-trend-is-here.html>

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REGULATORS INCLUDING ACCOUNTING AND VALUATION STANDARD SETTERS

Accounting and valuation standard setters have a fundamental role to play. They set the standards used by investors, valuers and others across the system, and therefore influence the extent to which climate risk is incorporated into valuations. In the financial accounting sphere, there has been a growing emphasis on the need to incorporate climate risk under existing financial reporting standards. In 2020, members of the A4S Accounting Bodies Network signed a **call to action**, calling upon the accountancy profession to respond to climate change with the urgency and scale required. This five step framework, developed with input from the standard setting community, provides a stepping stone towards integration into valuation standards.

Regulators act to protect investors and foster confidence and efficiency in capital markets and the financial system. With the growing understanding of climate change-related issues, regulators are increasingly setting standards and reviewing compliance with requirements to fulfil those objectives. Certain countries, such as New Zealand, have made it mandatory

for financial institutions to disclose significant risks, opportunities and financial impacts related to climate change. Regulatory guidance and ongoing reviews ensure climate change disclosures are complete, reliable and comparable among issuers. Prudential regulators consider how climate change could affect the financial soundness of individual banks, insurers and private pension plans and the stability of the financial system overall.

For example, in Canada, as the prudential financial regulator, the Office of the Superintendent of Financial Institutions ensures financial institutions are always prepared to continue functioning through a range of severe yet plausible economic scenarios and analyses how a major economic disruption could impact the financial system.

Promoting the incorporation of climate change risks and opportunities into regulators' valuations will help emphasize their importance to the other key stakeholders. This framework will help ensure they have the expertise and knowledge to do so.

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INTENDED BENEFITS AND LIMITATIONS

The purpose of this framework is to provide a methodology to incorporate the risks and opportunities associated with climate change into business valuation analyses. As discussed in the previous section, many organizations have already published guidance that addresses governance and risk management, as well as providing guidance on quantitative and qualitative disclosures related to climate change impacts. These recommended disclosures are enabling investors to better assess climate change-related risks and opportunities. Assessing the quantitative impact of such risks and opportunities through a systematic framework is the next step to holistically capturing the implications of climate change for business valuations. This framework provides a systematic way to assess the climate change risks and opportunities to which a subject entity is exposed.

The framework does this by:

- Providing potential sources of climate change information that can be used to inform valuation analyses
- Outlining a five-step valuation framework to incorporate key climate change considerations into the valuation of a business
- Acknowledging the complexity and the substantial professional judgement required to assess and quantify the impact of climate change, given the uncertain nature and limited data (albeit corporate disclosures are improving) currently available to permit a full and explicit assessment of the impact of climate change
- Acknowledging that it requires a solid understanding of the business, as well as meaningful climate change disclosures from the subject business (and comparable public entities operating within the industry) to appropriately quantify the impact
- Acknowledging and anticipating that the framework and considerations discussed will evolve and be refined over time as stakeholders gain more experience and the quality of corporate disclosures improves

The framework does not:

- Provide a prescriptive one-size-fits-all formula for factoring climate change into business valuations. Climate change risks and opportunities and their relative significance may vary substantially across asset classes and must be assessed on an individual basis
- Suggest which climate change / warming scenario(s) to adopt as a base case, or indicate the associated impacts of the adopted warming scenario on climate change risks and opportunities

The ability to include climate change factors in business valuations is dependent on the quality of the data available. Climate change disclosures are evolving and are still at an early stage. As such, it will require key stakeholders to ensure they are receiving appropriate disclosure so they can measurably consider the risks and opportunities. Additionally, there are current information and data limitations especially for private companies where they do not need to disclose the same information as public companies. At the time of developing this framework, we understand other parties are in the process of developing similar frameworks, but none has become widely accepted and used in practice. Further, this framework leverages the work done by the Task Force for Climate-related Financial Disclosures (TCFD).

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CLIMATE CHANGE VALUATION FRAMEWORK

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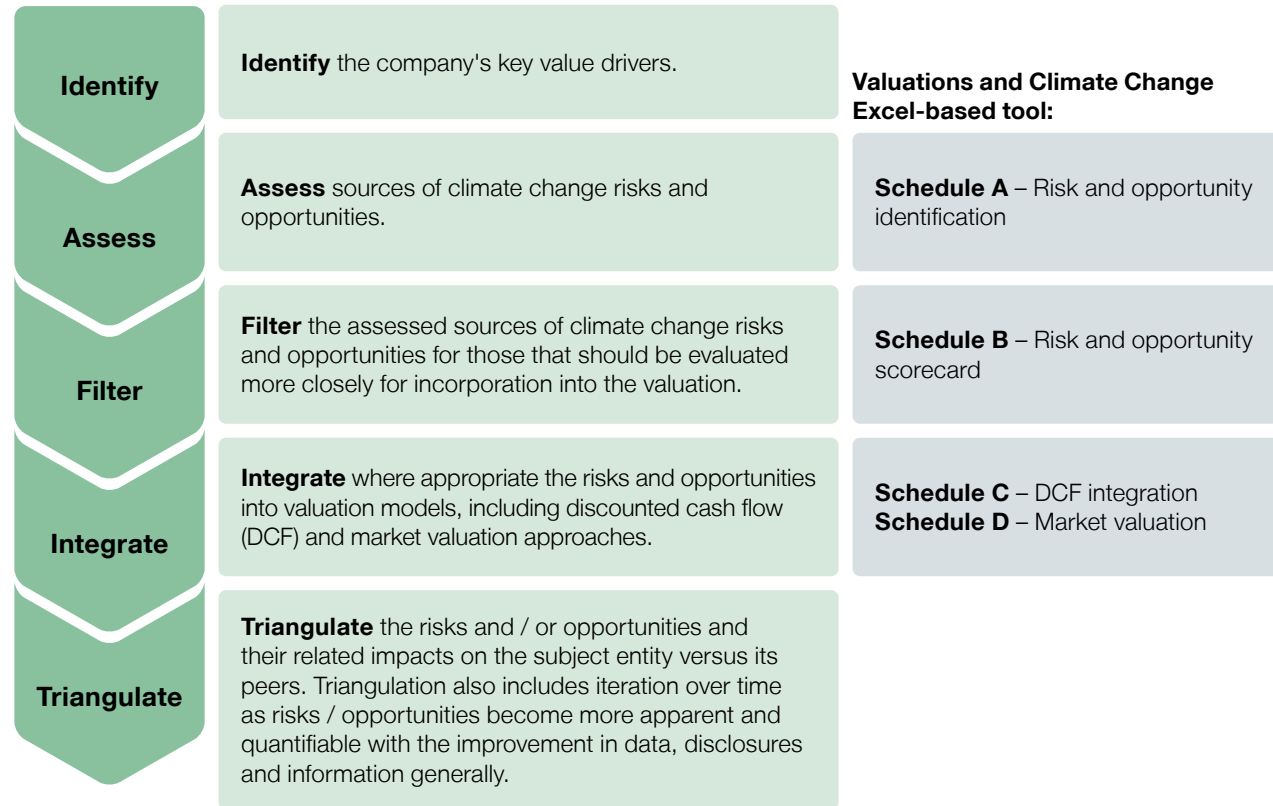
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OVERVIEW

Climate change is one factor among many that valuers need to consider in their valuation analyses. The following five-step Climate Change Valuation Framework sets out a process that valuers can use to integrate climate change risks and opportunities into their valuations. This framework considers only the incorporation of these risks and opportunities and not all the normal steps a valuer should follow when performing their valuation analysis.* In connection with this five-step framework an Excel-based tool has been developed to help guide and provide practical advice to aid the valuer in the documentation of their assessment.

THE FIVE-STEP CLIMATE CHANGE VALUATION FRAMEWORK



VALUATION TOOL TIP

This section should be read in conjunction with the Valuations and Climate Change Excel-based tool, which can be found here: www.accountingsustainability.org/valuations

Refer to the schedules found in the Excel tool to help perform the assessment.

*The framework is designed to sit alongside (or be integrated within) existing valuation procedures and it is intended to provide another dimension of consideration rather than serve as an isolated or stand-alone assessment separate from the broader overall valuation. For example, an income-based approach should include consideration of climate change assessments (in addition to other business factors) related to revenues, expenses, capital expenditures and discount rates. In a market-based approach, it is still necessary to understand the relative future growth prospects, size, risk and overall business comparability of the relevant public companies versus the subject company. Climate change, however, impacts add a further dimension to the analysis.

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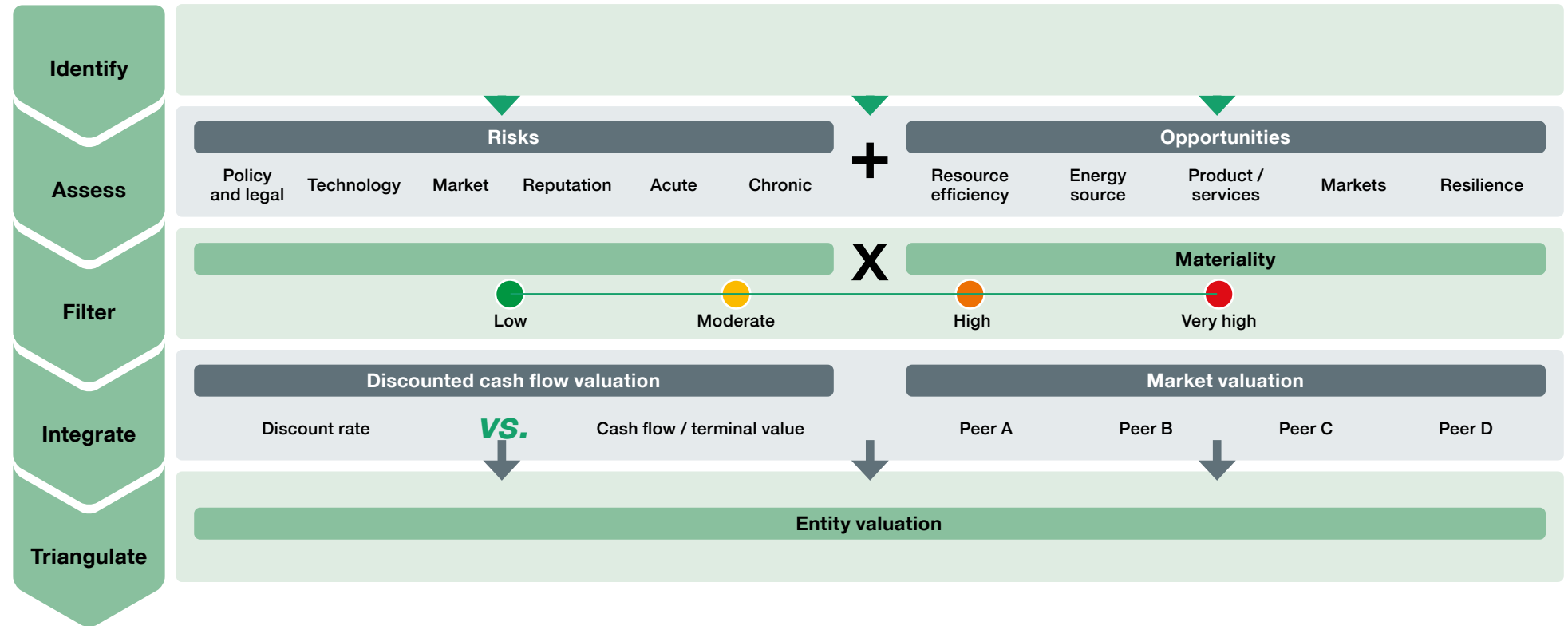
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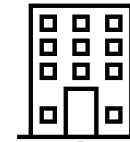
IDENTIFY



Identifying the key business value drivers will assist in identifying which climate-related risks or opportunities the company or asset may be exposed to and what adjustments, if any, may need to be made to the valuation. The key business drivers should help to identify the areas in which significant risks and / or opportunities are likely to be found.

START BY IDENTIFYING THE KEY VALUE DRIVERS OF THE COMPANY / ASSET

Business / asset



Possible consideration areas

Core activities

- What are the business's core activities?
- What is the nature of the good / service it offers?
- What is the company's value proposition?
- Does the business model rely on intellectual property of any kind?
- What is the strategic direction?

Operating environment

- What is the competitive landscape?
- What are the business' distribution channels?
- What is the regulatory environment?

Geographies

- Where does the business operate?
- Where are the business's markets?
- Where are inputs sourced?

Revenue / costs

- How does the business make money?
- Who are its customers?
- What is the business's cost structure?
- What are the major production inputs? (eg land, energy, raw materials, labour, etc)

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IDENTIFY: CASE STUDY



The following case study will help illustrate key concepts in the framework. Additional case studies are provided in [Appendix 5](#).

WASTE WATER MANAGEMENT (WWM)

Company background

- WWM is a waste treatment plant that can produce 100 megalitres per day of drinking water. The plant is located on Staten Island, New York, and is part of the New York City (NYC) drinking water supply network.
- WWM was built to supplement the drinking water supply of NYC and is required to be turned on or expand plant capacity to increase the amount of drinking water it supplies, depending on the surrounding dam levels.

Relevant case information about WWM

Regulatory framework

- WWM is regulated by the New York City Water Board under a framework that allows it to receive an inflation-adjusted return on its assets and to pass through its operating and maintenance costs subject to a review by the Board every six years.
- WWM completed its first rate determination and began the second regulatory period in 2017, which is set to expire in 2023.
- WWM earns its revenues from rates charged under a 40-year contract set to expire in 2051.

Dam levels

- According to the NYC Water Demand Management Plan (WDMP), WWM shall be turned on when dam levels drop below 50% and turned off when dam levels exceed 60%.
- The WDMP establishes a minimum run time for WWM of 15 months (regardless of dam levels) to reduce restart risk.
- WDMP also outlines dam level triggers for WWM to expand its productive capacity to 200 megalitres per day.

Energy costs

- WWM has contracted to purchase a minimum volume of fixed renewable electricity at a price (Certificates) and WWM earns tariff revenue on 90% of the energy used, which is sufficient to allow WWM to operate at full capacity.
- WWM sells the remaining unused 10% of Certificates on the open market at current market prices.
- The difference between the contracted price and the settlement price creates downside risk for WWM although limited to the 10% of the Certificates resold.



NOTICE TO READER

All names, data and other information may be loosely based on actual companies, geographies and situations, but have been substantially obscured for the purposes of these case studies. No descriptions, facts, circumstances or climate-risk assessments are meant to be taken as wholly factual, but rather are intended to provide an example of the potential application of the proposed guidance / framework to a private company valuation.

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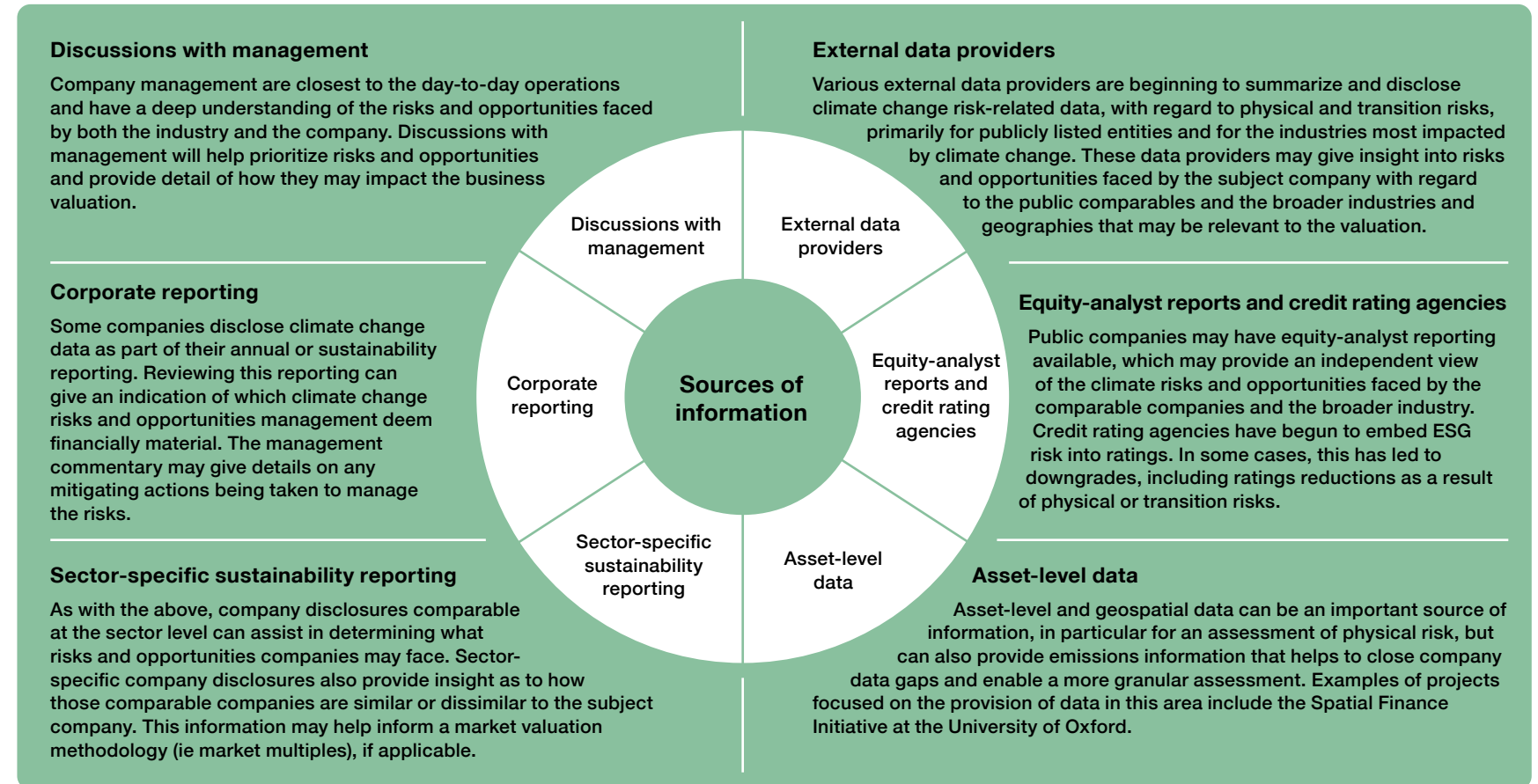
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ASSESS: POSSIBLE SOURCES OF COMPANY INFORMATION

Once the key business drivers of the subject entity have been identified, an assessment of the climate change risks and opportunities should be performed. This is done by identifying relevant sources of these climate change risks and opportunities for the company or asset, identifying existing or potential sources of mitigation and enablers and relating findings to key value drivers and strategies. These risks and opportunities can be identified from the following sources:



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ASSESS: THE CLIMATE REPORTING LANDSCAPE



There are various frameworks and standards available that underpin the way most companies report on climate-related risks, opportunities and impacts. A summary of the most widely adopted frameworks and the kind of information that can be derived from each is summarized below. Please see [Appendix 4](#) for further information.

As the assessment of the impacts of climate change continues to evolve, we expect most organizations impacted will evolve along with it, and new organizations, frameworks or requirements may be developed. However, there is currently a lack of consistency in what companies are disclosing; therefore, even if they are disclosing climate change risks, it may be difficult to compare them to others in their industry. **We expect that over time convergence will occur and companies, either through government regulations or on their own initiative, will begin to disclose information based on specific standards. The use of such standards should lead to improved disclosures and facilitate the extraction of climate change risk data from financial statement notes.** The availability and consistency of this information is extremely important for leveraging and assessing the impact of climate change risk in valuations.



Sustainability Accounting Standards Board (SASB)

SASB was established to develop industry-specific sustainability disclosure standards across environmental and social topics that facilitate communication between companies and investors about financially material, decision-useful information. Such information should be relevant, reliable and comparable across companies. For those sectors where climate change / GHG emissions are deemed to be financially material through SASB's standard-setting process, industry-specific disclosures are identified.



CDP

CDP runs a global environmental disclosure system. Every year, CDP requests detailed information on climate risks and low-carbon opportunities from the world's largest companies on behalf of institutional investors through its online disclosure questionnaire and platform. It aligns with the main standard-setting bodies where relevant while asking for more detailed information to support investor decisions.



Task Force on Climate-related Financial Disclosures (TCFD)

The TCFD was established to develop voluntary, consistent climate-related financial-risk disclosures for use by companies, asset managers and asset owners in providing information to investors, lenders, insurers, and other stakeholders. TCFD provides an overarching framework for disclosure covering four key areas: governance, strategy, risk and targets and metrics. It considers the physical and transition risks associated with climate change and what constitutes effective financial disclosures across industries. TCFD helps companies understand what financial markets want from disclosure in order to measure and respond to climate change risks and encourage firms to align their disclosures with investors' needs. In turn, these disclosures allow valuers to incorporate these risks into their valuation process. TCFD is rapidly gaining traction; a growing number of jurisdictions is moving toward mandatory adoption.



Global Reporting Initiative (GRI) and the Global Sustainability Standards Board (GSSB)

The GRI Standards have been developed in the public interest to enable organizations to report sustainability information that describes the organization's impact on the economy, environment or people, and hence the organization's contributions – positive or negative – to sustainable development. The GSSB is GRI's independent standard-setting body. Several standards are particularly relevant to the reporting of climate-related information, including: GRI 101: Foundation; GRI 102: General Disclosures; GRI 103: Management Approach; GRI 302: Energy; GRI 303: Water and Effluents; and GRI 305: Emissions. The first three of these standards set out reporting principles requiring contextual disclosure, and a description of how the organization manages a particular topic. GRI 302, 303 and 305 then set out disclosure requirements specifically for the reporting of energy, water and GHG and other emissions.



Greenhouse Gas Protocol

The Greenhouse Gas (GHG) Protocol supplies the most widely used greenhouse gas accounting standards, including definitions of Scope 1, 2 and 3 emissions. All other major climate-related reporting standards draw on, and align with, the GHG Protocol definitions.

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
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ASSESS: LENSES TO ASSESS CLIMATE CHANGE RISKS AND OPPORTUNITIES



This section is based upon the categorization of climate-related risks and opportunities given in the TCFD framework¹⁷. For each category, a selection of value considerations are highlighted that could be used within the initial assessment of risks and opportunities. The following section is not designed to be an exhaustive list of all climate change risks and opportunities; rather, it aims to provide a basis for conducting an initial scan of those that may impact the subject company. Refer to [Appendix 4](#) for detail regarding metrics recommended in the TCFD guidance and possible sources of information.

Description	Value considerations
 <p>Transition Risks – Policy Companies could experience increased costs and complexity from climate policy, regulation and carbon-pricing mechanisms designed to limit long-term effects of climate change and to encourage adaptation.</p>	<ul style="list-style-type: none"> • Changes in energy and transport costs • Compliance costs • Stranded asset risk • Competitor positioning • Relative competitive advantage
 <p>Transition Risks – Legal There could be legal consequences for the company if parties seek compensation for loss or damage from the effects of climate change. Such litigation could include i) negligence / wilful actions that cause harm, ii) failure of the defendant to act on the evidence, and iii) failure of public companies to disclose material risks.</p>	<ul style="list-style-type: none"> • Litigation expense • Brand reputation
 <p>Transition Risks – Technology Traditional business activity could be disrupted by the development of technology to support a low-carbon economy. More broadly, the pace of technology development has the potential to impact the magnitude of climate policy response by lowering the required future carbon price. Given the high degree of uncertainty in estimating future technology costs and deployment, it becomes especially important to monitor ongoing progress (eg by regularly reviewing cost projections for renewables relative to fossil fuels).</p>	<ul style="list-style-type: none"> • Operation and production processes and costs • Supply and distribution chains • Changes in demand • Changing competitor positioning • Relative competitive advantage

Further detail on what to consider can be found in Appendix 1.

¹⁷ Refer to the "Climate-Related Risks, Opportunities and Financial Impact" section of the "Final Report – Recommendations of the Task Force on Climate-related Financial Disclosures" (June 2017).

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ASSESS: LENSES TO ASSESS CLIMATE CHANGE RISKS AND OPPORTUNITIES



Description	Value considerations
 <p>Transition Risks – Market Changes in economic and social factors affecting demand and supply These include:</p> <ul style="list-style-type: none"> • Changes in consumer preferences and / or needs • Environmental impact of resources used • Competitor positioning / landscape • Uncertainty in market signals 	<ul style="list-style-type: none"> • Changes in demand • Increased costs and changes to operation and production processes • Availability and costs of financing (including insurance) • Changing competitive landscape / competitor positioning
 <p>Transition Risks – Reputation A firm’s reputation impacts many facets of its value. While we have already covered some aspects of reputational risk in “Market” and “Policy and legal”, we emphasize considering here whether there are any other reputation risks not already covered above. These could include shifts in consumer preferences and increased stakeholder concern or negative stakeholder feedback.</p>	<ul style="list-style-type: none"> • Company reputation and brand value • Changing investor-relations environment • Company appeal as an employer • Availability and cost of capital • Reduced demand for goods and services because of shift in consumer preferences

Further detail on what to consider can be found in **Appendix 1**.

ASSESS: LENSES TO ASSESS CLIMATE CHANGE RISKS AND OPPORTUNITIES




	Description	Value considerations
<p>Identify</p> <p>Assess</p> <p>Filter</p> <p>Integrate</p> <p>Triangulate</p>	 <p>Physical Risks – Chronic</p> <p>There could be slow-onset shifts in everyday environmental factors:</p> <ul style="list-style-type: none"> • Temperature increases • Sea level rises • Variations in precipitation patterns and soil quality • Changes of ecological systems • Shifts in operating environments • Altered agricultural productivity • New socio-political environment • Health risks • Scarcity of resources (eg clean water and food sources) 	<ul style="list-style-type: none"> • Availability and / or cost of production inputs (raw materials, labour, energy, etc) • Changes in availability of productive land, supply and distribution chains, changes in demand • Viability of assets / infrastructure and property valuations • Reduced production capacity
	 <p>Physical Risks – Acute</p> <p>Extreme weather events can cause damage to investments. These include:</p> <ul style="list-style-type: none"> • Flooding • Fire • Strong winds • Extreme temperatures • Precipitation • Supply chain disruption • Volatility of key commodity prices 	<ul style="list-style-type: none"> • Impact on physical assets (land, processing and storage facilities, offices, etc) • Availability and / or cost of production inputs (raw materials, labour, energy, etc) • Viability / resilience of operations • Level of exposure of supply and distribution chains • Changes in demand

Further detail on what to consider can be found in Appendix 1.



ASSESS: LENSES TO ASSESS CLIMATE CHANGE RISKS AND OPPORTUNITIES



In addition to identifying ways that physical and transition risk might affect company value, the TCFD provides examples of a number of potential opportunities in the response to climate change, described below.

Description	Value considerations
 <p>Opportunities – Products and services New products and services can assist adaptation to climate change:</p> <ul style="list-style-type: none"> • Development and / or expansion of low-emission goods and services • Development of climate adaptation and insurance-risk solutions • Development of new products or services through research, development and innovation • Diversification of business activities • Shifts in consumer preferences 	<ul style="list-style-type: none"> • Increased revenue through demand for lower-emissions products and services • Increased revenue through new solutions to adaptation needs (eg insurance-risk transfer products and services) • Increased revenue from better competitive position to reflect shifting consumer preferences
 <p>Opportunities – Markets Market factors can support adaptation to climate risks and opportunities:</p> <ul style="list-style-type: none"> • Access to new markets can diversify market risks • Use of public-sector incentives can reduce adaptation costs • Access to new assets and locations needing insurance coverage 	<ul style="list-style-type: none"> • Increased revenue through access to new and emerging markets (eg partnerships with governments, development banks) • Increased diversification of financial assets (eg green bonds and infrastructure)
 <p>Opportunities – Resilience Companies developing adaptive capacity to respond to climate change through:</p> <ul style="list-style-type: none"> • Participation in renewable energy programmes • Adoption of energy-efficiency measures • Use of resource substitutes • Diversification 	<ul style="list-style-type: none"> • Increased market valuation through resilience planning (eg infrastructure, land, buildings) • Increased reliability of supply chain and ability to operate under various conditions • Increased revenue through new products and services related to ensuring resiliency

ASSESS: LENSES TO ASSESS CLIMATE CHANGE RISKS AND OPPORTUNITIES

	Description	Value considerations
Identify	 <p>Opportunities – Resource efficiency Better use of resources reduces adaptation risks:</p> <ul style="list-style-type: none"> • More efficient modes of transport • More efficient production and distribution processes • Increased reuse of material • More efficient buildings • Reduced water consumption 	<ul style="list-style-type: none"> • Reduced operating costs • Increased production capacity and value of fixed assets (eg highly rated energy-efficient buildings) • Benefits to workforce management and planning (eg improved health and safety)
Assess		
Filter	 <p>Opportunities – Energy source More efficient energy use cuts adaptation costs and increases sustainability:</p> <ul style="list-style-type: none"> • Lower-emission sources of energy • Supportive policy incentives • New technologies • Participation in carbon market • Shift toward decentralized energy generation 	<ul style="list-style-type: none"> • Reduced operational costs • Reduced exposure to fossil fuel price increases • Reduced GHG emissions and therefore less sensitivity to changes in cost of carbon • Returns on investment in low-emission technology • Increased capital availability (as more investors favour lower-emissions producers) • Reputational benefits resulting in increased demand for goods / services
Integrate		
Triangulate		

ASSESS: WWM CASE STUDY



Rising sea levels

Given Staten Island is bordered by a body of water, it is susceptible to the impact of rising sea levels caused by climate change. Although the timing and intensity of rising sea levels is unknown, WWM's geographic location makes it susceptible to this chronic physical risk.

Water supply regulations

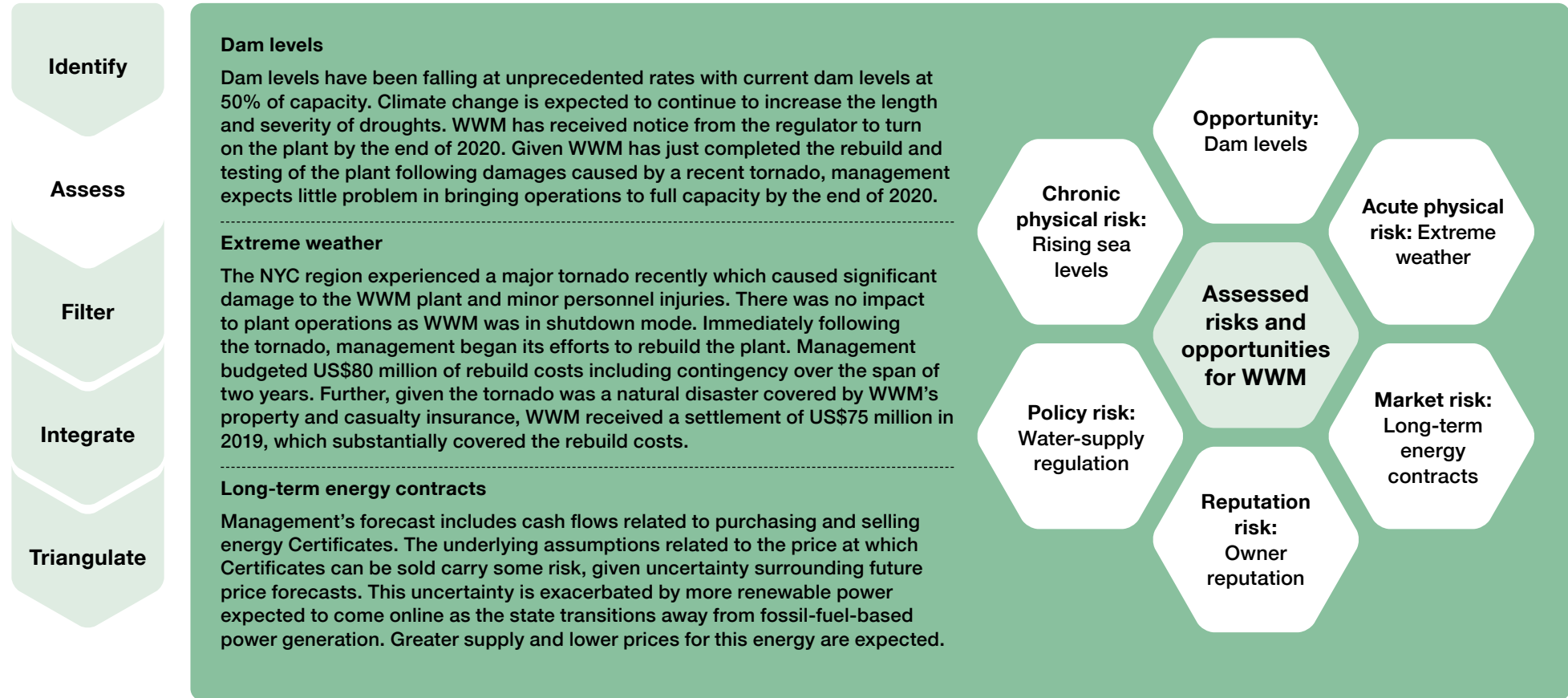
The current regulatory period ends in 2023, and the regulatory framework for the next regulatory period has not been finalized. As climate change continues to increase the strain on NYC's drinking water supply, the regulator indicated that, for the first time, they may reduce WWM's profits in order to make water more affordable for the population via a contemplated reduction of the regulated return on WWM's asset base. Further, the reduced profit framework may persist given the increasingly critical role WWM plays in NYC's drinking water supply network. Management's base case reflects a 100-basis-point reduction in regulated return.

Owner reputation

There is the potential that WWM, and its shareholders, may be viewed as benefiting from the negative effects of climate change, as WWM's output and thus profit would increase with decreasing dam levels. This adds incremental risk to the business, as there is potential backlash from regulators, the government and the population that WWM serves, among other stakeholders, which has the potential to ultimately lead to lower regulatory rates.



ASSESS: WWM CASE STUDY



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FILTER: LIKELIHOOD AND MATERIALITY ASSESSMENT



This step in the framework filters the identified climate change risk and opportunities that a subject entity may encounter. The factors should be filtered, using available information and best judgement to arrive at the expected significant impacts for which the valuation impact can be estimated.* For each risk and opportunity, the following two factors should be considered: the likelihood of occurrence and the determined level of financial impact the event may have (ie materiality).

In determining the likelihood of occurrence and potential level of impact, consider available evidence, apply judgement, use industry benchmarking if practicable and consider any interrelationship between risks / opportunities. Refer to **Appendix 2** for a list of data providers giving information which could be useful to assess the likelihood and significance of climate-related risks and opportunities for a subject entity.

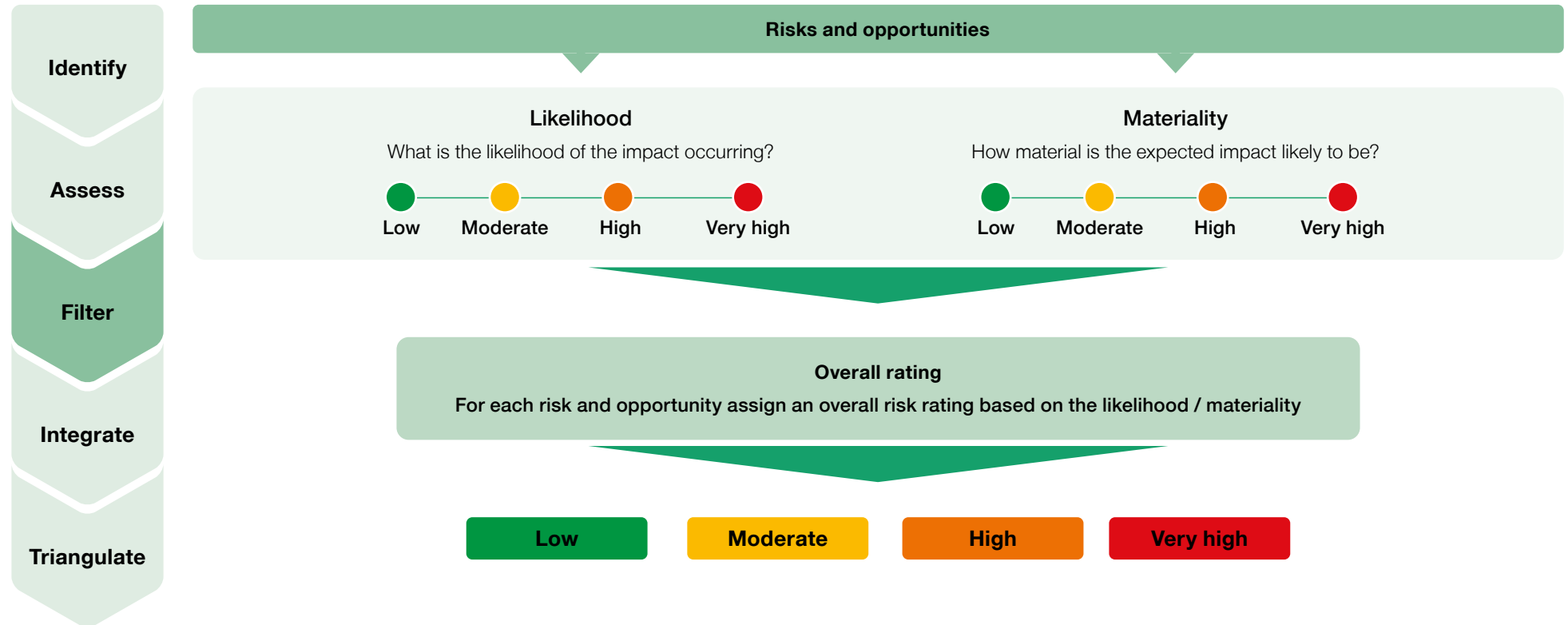
When assessing the level of financial impact, the actual impact to the financials should be considered, such as:

- What would be the cost to react to the climate change risk after it has occurred? (eg What is the cost of rebuilding a factory that is in a hurricane’s path?)
- What would be the cost to mitigate a climate change risk before it occurs? (eg What is the cost of moving locations prior to the arrival of the hurricane?)
- What are the revenue opportunities available from operating in a new market and the associated costs to enter that market?
- How soon is the impact going to be realized? (eg Impacts expected in the next decade may be more material to value than those expected in 20 years because of the time value of money)

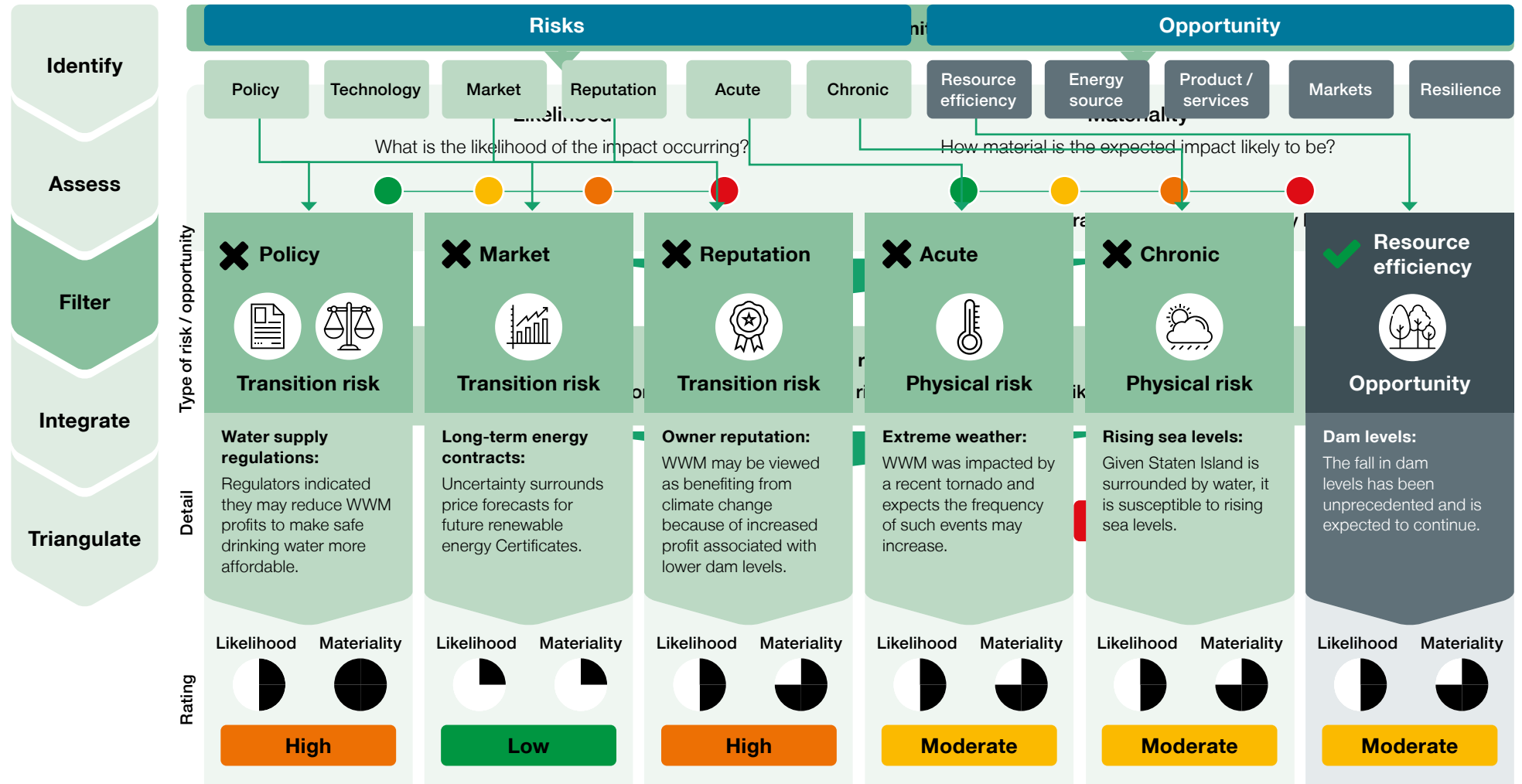
The likelihood and level of impact of the risks and opportunities are assessed separately on a sliding scale from “low to very high”. A decision is then made on the overall rating for that risk or opportunity based on consideration of those two dimensions. It should be noted, however, that the overall risk rating does not have to be the average of the rating, applied to the likelihood and the impact. For instance, if likelihood is assigned a high rating, but the impact is low, that does not necessarily mean the overall rating associated with that risk or opportunity will be moderate. Professional judgement will need to be applied to arrive at the overall rating, which should be a reflection of the valuator’s assessment of the ultimate impact to the value of the subject entity.

* There may be risks or opportunities which are probable / material but which are difficult or challenging to adjust for because of insufficient reliable information or uncertainty in forecasts. These should be tracked and monitored over time, such that the valuation can be refined over time as better information becomes available.

FILTER: LIKELIHOOD AND MATERIALITY ASSESSMENT



FILTER: WWM CASE STUDY



INTEGRATE: ASSESS WHERE IN THE DCF TO ADJUST FOR RISKS AND OPPORTUNITIES



Once the risks and opportunities associated with climate change have been filtered, the next point for consideration is how those risks and opportunities translate into a financial valuation impact. There are many approaches to valuation; this framework focuses on the integration of climate change risks and opportunities through the discounted cash flow (DCF) approach and market approach (specifically, comparable company relative analysis).

Discounted cash flow: The decision whether to include climate change risks and / or opportunities in either the discount rate or cash flow is impacted by the ability to quantify and reflect the risk in cash flows, the reliability of estimates used to perform that quantification, and the certainty with which the risks will impact the business. Generally, as quantifiability, reliability and certainty of risks and opportunities increase, it is preferable to include these risks / opportunities in the cash flows rather than the discount rate. Certain risks and opportunities may impact the discrete cash flows, the terminal value considerations, or both, depending on the time horizon of the forecasts and the climate change impacts.

When adjusting the discount rate, it is important to assess whether the risk or opportunity presented is industry wide. If it is, it may already be priced into the discount rate by the market. At the current time there has been little evidence the market is pricing in these risks and opportunities. However, as climate change increasingly becomes a focus, it is likely to be considered and priced in by the market. It is also imperative to ensure no double counting of risks or opportunities has occurred among the discrete cash flows, terminal value and discount-rate assessment.

Deciding whether to adjust discount rate or cash flows

Uncertain cash flow impact /
challenging to quantify cash flows

Some visibility / certainty of cash flow impact
and some ability to quantify

High visibility / certainty of cash
flow impact and quantification

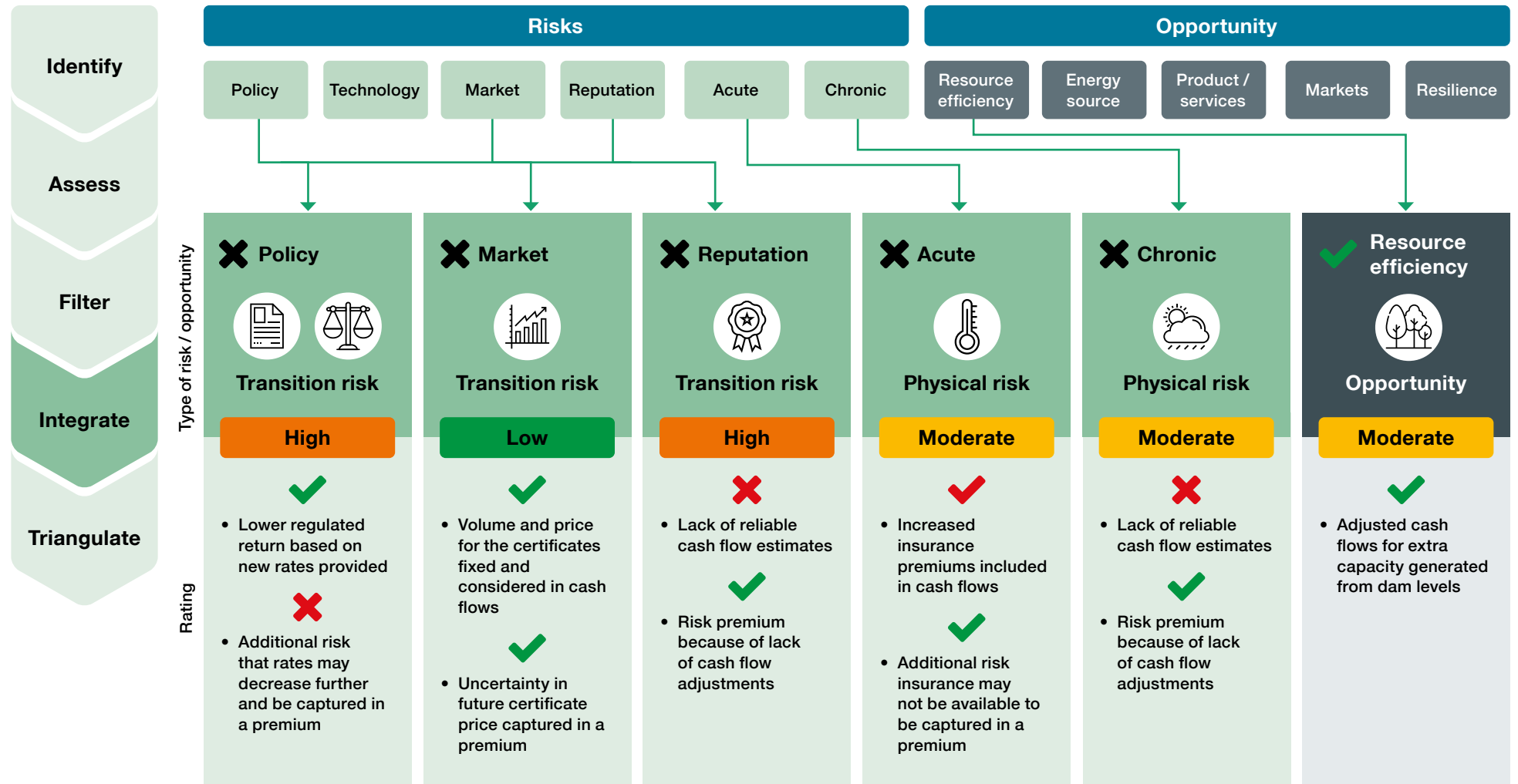
Adjust discount rate

- The adjusted discount rate should be used when you cannot easily or reliably quantify the impact of climate change on the business, but you think it will probably have a significant impact on value, and the discount rate impact can be reasonably estimated.
- The quantification of the adjustment may be informed / implied by performing cash flow sensitivities. Arriving at a reasonable sensitivity analysis to size the discount rate adjustment may be challenging where uncertainty is high. Sometimes an “upside” and “downside” scenario analysis may be used to reflect this uncertainty (eg regulation potential or proposed but not passed in law, highly uncertain timing and quantification).

Adjust cash flows and / or terminal value

- These are the preferred ways to incorporate expected climate change impacts into a valuation (where practical).
- Climate change impacts all elements of the cash flows, including revenues, costs and capital expenditures.
- Beware of elasticities in value drivers (eg between price and demand).
- Watch for regulation affirmed in law. Moderate uncertainty around timing and quantification.
- Calculate highly measurable and certain, immediate and known impact to cash flows.

INTEGRATE: CASE STUDY



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INTEGRATE: CASE STUDY



Valuation ignoring climate change	Percent	FY + 1	FY + 2	FY + 3	FY + 4	FY + 5	Terminal
Free cash flows		100	110	120	130	140	150
Adjustments:							
Adjusted free cash flows		100	110	120	130	140	150
Terminal value							2,143
Present value factor	9.00%	0.96	0.88	0.81	0.74	0.68	0.68
Discounted cash flows		96	97	97	96	95	1,454
Fair value		1,934					

Valuation considering climate change	Percent	FY + 1	FY + 2	FY + 3	FY + 4	FY + 5	Terminal
Free cash flows		100	110	120	130	140	150
Adjustments:							
• Lower return on regulated rates		(10)	(11)	(12)	(13)	(14)	(15)
• Certificate costs		(5)	(6)	(6)	(7)	(7)	(8)
• Insurance premiums		(2)	(3)	(3)	(4)	(4)	(5)
• Extra capacity		10	11	12	13	14	15
Adjusted free cash flows		93	101	111	119	129	138
Terminal value							,781
Present value factor	9.75%	0.95	0.87	0.79	0.72	0.66	0.66
Discounted cash flows		89	88	88	86	85	1,172
Fair value		1,611					

Although in this case study the value has decreased, this will not be the case in all instances. As climate change is a business risk, some valuations may already reflect the impact of climate change. In some cases it may present an opportunity and therefore increase the value of a business.

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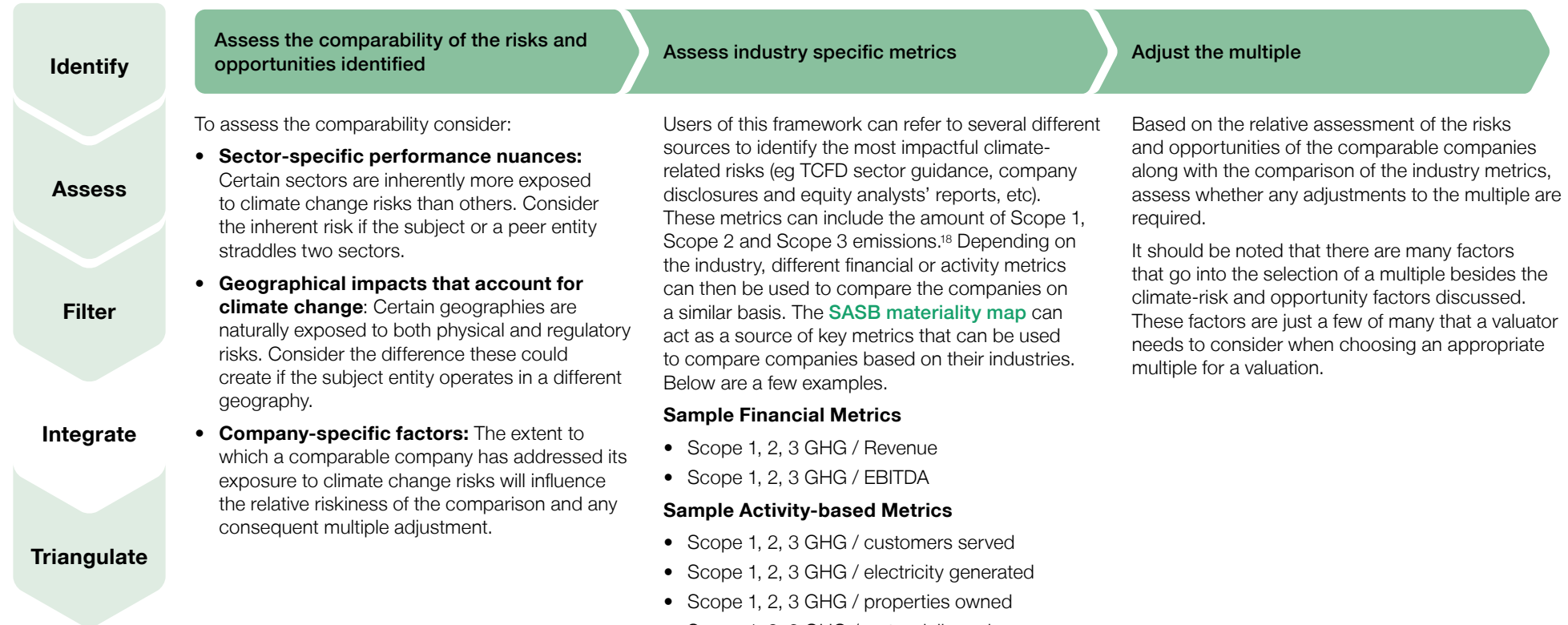
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INTEGRATE: ASSESS WHETHER ADJUSTMENTS IN MULTIPLES ARE REQUIRED



To assess the comparability consider:

- **Sector-specific performance nuances:** Certain sectors are inherently more exposed to climate change risks than others. Consider the inherent risk if the subject or a peer entity straddles two sectors.
- **Geographical impacts that account for climate change:** Certain geographies are naturally exposed to both physical and regulatory risks. Consider the difference these could create if the subject entity operates in a different geography.
- **Company-specific factors:** The extent to which a comparable company has addressed its exposure to climate change risks will influence the relative riskiness of the comparison and any consequent multiple adjustment.

Users of this framework can refer to several different sources to identify the most impactful climate-related risks (eg TCFD sector guidance, company disclosures and equity analysts' reports, etc). These metrics can include the amount of Scope 1, Scope 2 and Scope 3 emissions.¹⁸ Depending on the industry, different financial or activity metrics can then be used to compare the companies on a similar basis. The **SASB materiality map** can act as a source of key metrics that can be used to compare companies based on their industries. Below are a few examples.

Sample Financial Metrics

- Scope 1, 2, 3 GHG / Revenue
- Scope 1, 2, 3 GHG / EBITDA

Sample Activity-based Metrics

- Scope 1, 2, 3 GHG / customers served
- Scope 1, 2, 3 GHG / electricity generated
- Scope 1, 2, 3 GHG / properties owned
- Scope 1, 2, 3 GHG / water delivered
- Scope 1, 2, 3 GHG / crop production

Based on the relative assessment of the risks and opportunities of the comparable companies along with the comparison of the industry metrics, assess whether any adjustments to the multiple are required.

It should be noted that there are many factors that go into the selection of a multiple besides the climate-risk and opportunity factors discussed. These factors are just a few of many that a valuator needs to consider when choosing an appropriate multiple for a valuation.

¹⁸ Scope 1 emissions are direct emissions from owned or controlled sources. Scope 2 emissions are indirect emissions from the generation of purchased energy. Scope 3 emissions are all indirect emissions that occur in the value chain of the reporting company, including both upstream and downstream emissions. Please see page 24 for information on the GHG Protocol and SASB.

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INTEGRATE: WWM CASE STUDY



WWM has two publicly traded comparable companies, which it has been assessed against to determine whether any adjustments to the multiple used in the market-approach valuation are required.

	CALIFORNIA WATER MANAGEMENT	ALABAMA WATER GROUP	WWM
Type	Provides water utility and other related services in California.	Provides water and electric services to residential, industrial and other customers in Alabama.	
Sector	Utilities	Utilities	Utilities
Geography	United States – California	United States – Alabama	United States – New York
Scope 1 and 2 emissions	0.55 Mt CO ₂ e	0.70 Mt CO ₂ e	0.60 Mt CO ₂ e
Emissions / Revenue	600 tCO ₂ e / US\$M	650 tCO ₂ e / US\$M	625 tCO ₂ e / US\$M
Enterprise Value / EBITDA	10.0x	10.0x	10.0x

Based on the above comparison, California Water Management and Alabama Water Group both operate in the same sector as WWM. Although the geographical exposure differs across the companies because of their varying physical risk profiles, the overall impacts of physical risk on value are considered to be reasonably similar. In addition, the emissions / revenue for WWM and its peers is relatively consistent. Therefore, the above assessment indicates that no adjustment to the multiple is necessary. Under the market approach, WWM has a value of **US\$1,500**.

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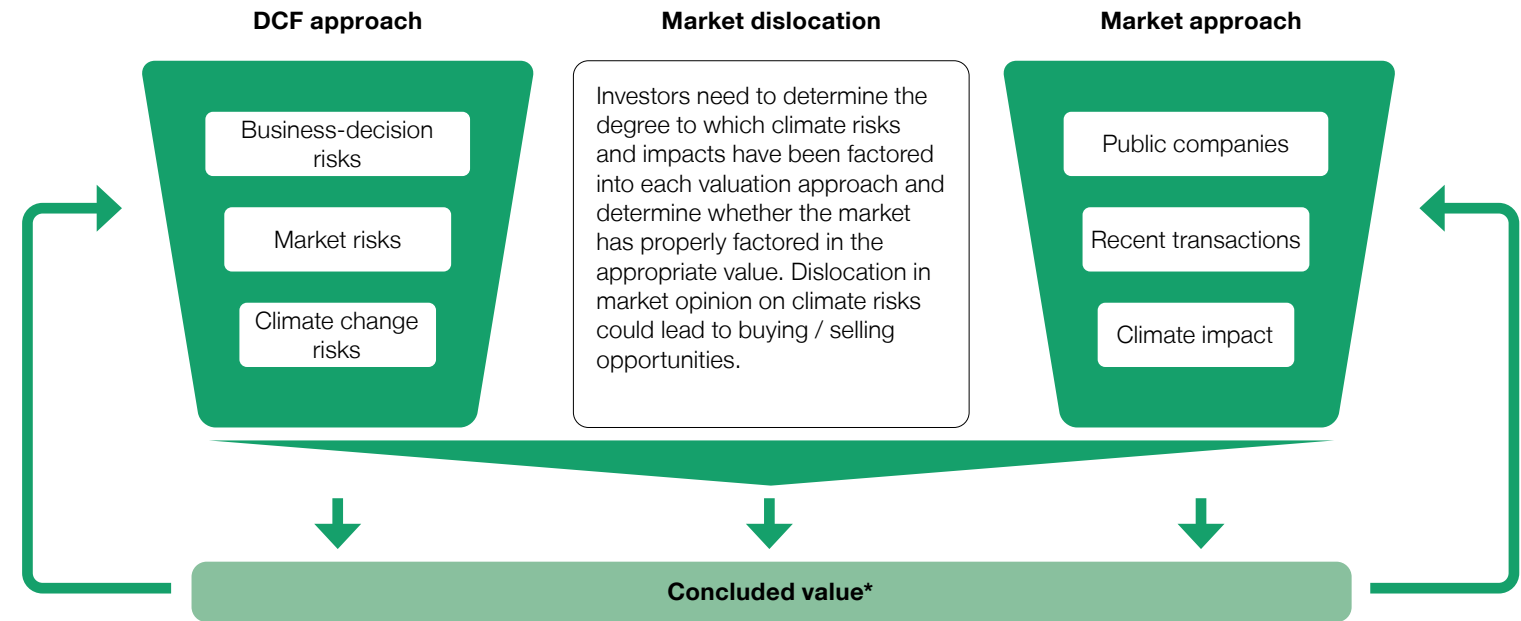
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TRIANGULATE



The final step of the framework is triangulation. Once the climate change risks and opportunities have been assessed, it is important for the valuator to assess the estimated value of the subject entity in relation to market considerations.



Additional considerations

Considerations relating to terminal value, holding period, and exit strategy may be particularly sensitive to climate change risks, since climate change effects are expected to increase in significance in the decades to come. Many cash flow forecasts are of shorter lengths (five to 10 years) and may not fully reflect long-term climate change risks if near-term impacts are not as significant. It is important, therefore, to consider the inherent assumptions within terminal values such as perpetual growth or a constant discount rate. Businesses or assets may become stranded in the long term and a perpetual going concern assumption may not be appropriate.

Investors in businesses more heavily exposed to climate change risks in the long term may face challenges in realizing desired exit strategies.

* Risks and opportunities should be tracked and monitored such that the valuation can be refined over time as better information becomes available.

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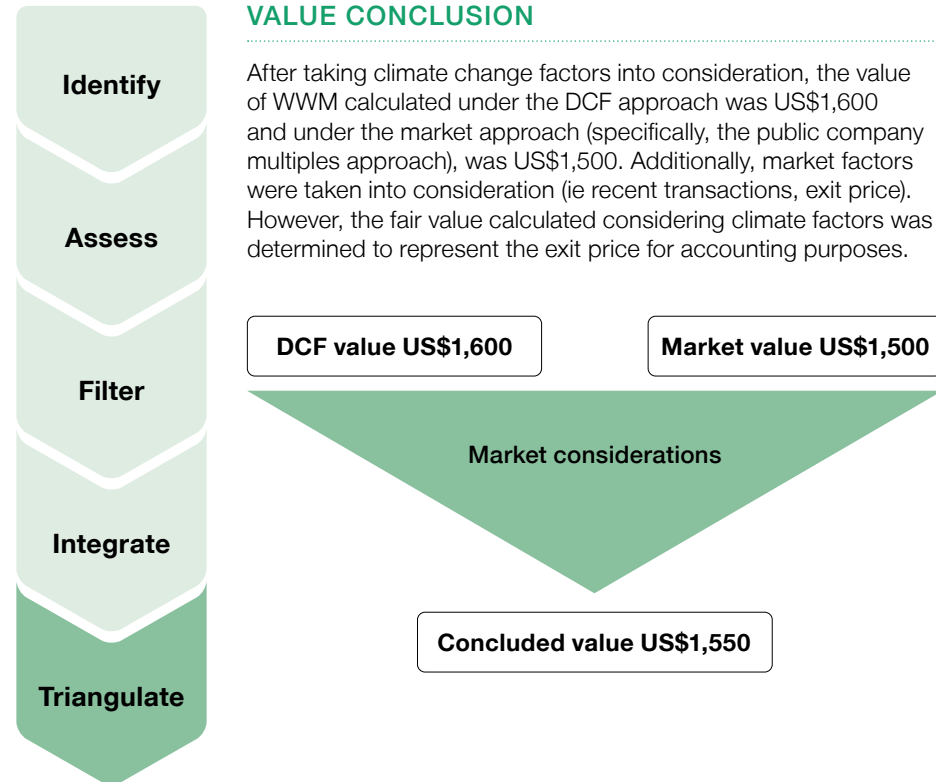
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TRIANGULATE: CASE STUDY



VALUE CONCLUSION

After taking climate change factors into consideration, the value of WWM calculated under the DCF approach was US\$1,600 and under the market approach (specifically, the public company multiples approach), was US\$1,500. Additionally, market factors were taken into consideration (ie recent transactions, exit price). However, the fair value calculated considering climate factors was determined to represent the exit price for accounting purposes.

Additional considerations

Market

The DCF and market approaches may imply a value very different from what the market is willing to pay for a private asset because the market may not have fully priced in the risks related to climate change, which can be significant.

Application

As noted earlier, the context in which the framework is applied by various users may differ. Because fair value according to accounting standards reflects an exit price concept and is dependent on what the market is willing to pay at the valuation date, the value conclusion should be revisited to assess whether the exit price and market factors have been appropriately factored in.

Market dislocation

The differing values implied under the DCF and market approaches may, however, be evidence of a potential dislocation in the market in relation to views on climate change risks and impacts. This could indicate the market is under- or over-pricing risks and, as such, could present a buying or selling opportunity for an investor for both private and public investments.

Upside and downside

Investors need to be vigilant and properly consider the potential upside and downside of climate change when making decisions now since, going forward, the market may turn in the future and no longer pay premiums (for climate-risky assets), nor discount the value of climate-defensive assets.

Double counting

It is important to consider the potential for “double counting” of climate change value impacts. The explicit consideration of climate change factors by valuers and investors is in its infancy; however, certain factors may already be implicitly incorporated into valuations. There may be correlation of certain characteristics already considered in valuations with climate change risk factors. Much care will need to be taken not to double count these as “new climate change risks”. For example, it is customary to include a risk premium in the discount rate (or discount to the comparable company multiples) to account for the relatively smaller size of a subject company (where applicable). These risk premiums are supported by historical analysis that shows a statistically higher rate of return for smaller companies as compared to larger companies. It may be a reasonable expectation that larger public enterprises will score better on climate change factors compared to smaller private enterprises (ie large enterprises have the resources and expertise to implement a strong plan and response to climate change risks and be in a better position to take advantage of opportunities). As such, current practice related to size premiums may already implicitly account for some of the risk associated with climate change factors. This represents just one example among many of the potential for overlap or double counting.

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Policy lens

Climate policies, carbon pricing and regulations to encourage sustainable business operating changes may lead to increased costs and complexity.

Mega themes

Governments will focus on minimizing the impact of climate change, both domestically and globally, and will drive new laws and policy initiatives that seek to restrict negative contributors and to promote adaptation to climate change

Regulatory environment

The political environment will provide insight into the rate of change the company and its industry could be forced to take:

- What is the political backdrop of the markets in which the business is operating?
- Is climate change high on the political agenda?
- Is there potential for protectionist policies (eg export restrictions) in the company's markets?

In some sectors, specific regulations to incentivize or mandate change will expose competitive differences between companies in their ability to respond. For instance:

- Maximum product emission standards
- Emissions trading schemes
- Tariffs on carbon emissions – “cost of carbon” type policies
- Taxes on fuel

Management

What is management's plan to address regulatory issues and opportunities that may arise because of climate change?

Key value considerations

Risks

- Emissions trading schemes increase transport and energy costs.
- Carbon taxes increase transport and energy costs.
- Restrictions on burning fossil fuels increase prevalence of stranded assets.
- Global agreements increase operational costs (eg compliance, increased insurance premiums, etc).

Opportunities

- Government purchasing decisions and subsidies aligned with policy decisions improve revenue / margins.

Mitigation

- Management adopts less carbon-intensive methods of production to minimize exposure to increased costs of doing business.

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Legal lens

The legal lens refers to litigation that could occur if parties who claim loss or damage from the effects of climate change seek compensation from those that they hold responsible. Such claims could allege: i) climate negligence / wilful actions that cause harm; ii) failure to act on the evidence; and iii) public companies failing to disclose material risks.

Mega themes

Increased consumer, investor and government awareness of climate change

Socio-political pressure to hold responsible companies to account

Business operations

- Is the business heavily dependent on unsustainable / carbon-intensive energy production or inputs?
- What are the effects of changes in legislation to cost and availability of supply inputs, processing, distribution etc and how might this impact on the sustainability of business operations?
- Does the company have a record of supply chain disruption as a result of legal charges?
- Has the company disclosed its risk exposure to climate change?

Management / governance

- Does the company engage with consumers and investors on ESG?
- Has the company disclosed climate change-related risks and how these risks are managed?
- What role does the board play in overseeing climate-related issues?

Key value considerations

Risks

- The company misleads consumers about the environmental standard of its product and faces litigation and brand damage.
- A listed company is fined for failing to disclose material risks.
- Insurance companies are exposed to the litigation costs of insured companies.
- A data storage provider loses client data in a storm and faces litigation and reputational damage.

Opportunities

- Litigation insurance

Mitigation

- The company identifies and manages environmental risks.
- Full disclosure of material risks is made to investors.
- A data storage provider builds facilities designed to withstand severe storms and diversifies across geographic locations to minimize the chance of information loss.

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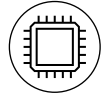
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Technology lens

The technology lens refers to disruption driven by the development of new technology to support a low-carbon economy. More broadly, the pace of technology development has the potential to impact the magnitude of climate-policy response by lowering the required future carbon price. Given the high degree of uncertainty in estimating future technology costs and deployment, it becomes especially important to monitor ongoing progress (eg by regularly reviewing cost projections for renewables relative to fuels).

Mega themes

Technological advancements / innovation in energy, production and transport

Potential for redundancy of systems or products

The timing of technology development and deployment is a key uncertainty

Key value considerations

Technological innovation

Technological improvements or innovations can have a significant impact on a company. For instance:

- Improvements in renewable energy, battery storage, and carbon capture and storage will affect the competitiveness of certain organizations, their production and distribution costs, and ultimately the demand for their products or services.
- Winning companies or industries will be those able to access the best technologies at the lowest cost.
- Unsuccessful investment in new technologies is a risk.
- Existing assets may need to be written off or retired early.
- Costs of adopting / deploying new practices and processes may be high.

Creative destruction

- To the extent new technology displaces old systems or products or disrupts parts of the existing economy, there will be winners and losers.

Management

- What is management's plan to address technology-related issues and opportunities that may arise in a climate changed world?

Risks

- New technologies change the competitive landscape by creating margin pressure or making products obsolete by reducing revenue.
- Higher demand for energy-efficient products to reduce consumption and meet compliance standards means investing capital to make changes in the manufacturing process.
- Higher research and development and capex will be required in new technologies, and higher costs will be necessary to adopt / deploy new practices and processes.

Opportunities

- New markets arise due to technological advancement and create new revenue streams.
- Technological advancements reduce production costs and widen margins.

Mitigation

- Management leverages new technologies to create more efficient buildings / transport, etc, thus reducing operating costs.
- Investing in research and development to create climate-conscious versions of a product prevents demand erosion.

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Market lens

Market lens refers to changes in economic and social factors affecting demand and supply. These include: i) changing consumer preferences and / or needs; ii) environmental impact of resources used; iii) competitor positioning / landscape; and iv) uncertainty in market signals.

Mega themes

Increased consumer, investor and government awareness of climate change

Changing operating environment, including the availability and cost of production

Potential for significant events such as mass migration of people or conflicts between countries over scarce resources

Key value considerations

Demand

Demand for products or services may change because of a shift in the preferences or needs of consumers, government, investors or other businesses:

- How exposed is the business's product / service offering to customer preferences? Is demand elastic or inelastic? Is the product or service a necessity or a luxury? Are there many substitutes?
- Is the industry under a high level of scrutiny?
- Is the business heavily dependent on unsustainable / carbon-intensive energy production?
- Is there potential for government funding to be directed toward or away from any product / service?

Supply

Production output and costs may be affected by how climate change will impact production and supply chains. Consider the availability, cost and potential disruption to:

- Raw materials, processing techniques, transport / distribution.
- Other key inputs such as labour, energy and capital.
- Pricing of assets (eg fossil fuel reserves, land valuations).

It is necessary to understand the environmental impact on competitors of inputs, processing and distribution of production in absolute and relative terms:

- Competitor supply chains may be affected differently. Are their business operations sustainable? (eg supply inputs, processing, distribution, etc).
- Is climate change an industry issue? How does the business compare to competitors?

Management

- What is management's plan to address demand- and / or supply-related issues and opportunities that arise due to climate change?
- Does management have a good track record of engaging with consumers and investors on ESG matters?

Risks

- Competitors with more robust supply chains gain market share.
- Mass migration changes demand patterns and labour availability.
- Lack of sustainable production capability damages brand, reducing demand and, therefore, revenue.
- Assets must be repriced because of changing demand patterns for a company's products.

Opportunities

- New markets arise generating new revenue streams because of consumer / government support for a new industry, product or service.
- Company is a leader in sustainable practices, gains market share and increases revenue.

Mitigation

- Management anticipates shifts in consumer sentiment and adapts business strategy to diversify revenue sources.
- Company engages with investors and consumers to stay abreast of changing sentiment.

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Reputation lens

Reputation lens refers to the fact that a firm's reputation impacts many facets of its value. Some aspects of reputational risk have already been covered in "Market" and "Policy and Legal"; other aspects include shifts in consumer preferences and increased stakeholder concern or negative stakeholder feedback.

Mega themes

Shifts in investor preferences due to widespread application of climate-related exclusions, shareholder activism, regulatory / public pressure and rising cost of capital for high emitters

Complex and potentially dramatic shifts in ecosystems are expected

Exposure

- Availability and future cost of capital may be more difficult to access both via bank lending and capital markets.
- Availability of labour may be impacted due to diminished attractiveness as an employer if the / sector is known as a high emitter, which may lead to rising labour costs, declining productivity or increased turnover / retention issues.
- Reduced revenue from decreased production capacity (eg delayed planning approvals, supply chain interruptions).
- Reduced demand for goods and services because of shift in consumer preferences.

Management

- Does management have a good relationship with consumers, suppliers, communities, investors and other stakeholders?
- Does management actively seek to understand and act on current and prospective preferences and views?
- Does management track and respond to changing consumer and other stakeholder preferences and perceptions of the company?

Key value considerations

Risks

- Widespread divestment from a particular sector or curtailment of bank lending as a result of revised lending policies could lead to higher cost of capital.
- Specific company projects may be abandoned because of shareholder / stakeholder pressure thus reducing the growth outlook or incurring unforeseen costs.
- Difficulty in attracting / retaining skilled staff results in lower profitability.

Opportunities

- Firms perceived as being "on the right side" of climate change may experience a lower cost of capital, ease in attracting employees and an eagerness from stakeholders to work with them.

Mitigation

- Enhanced climate-related disclosures and more climate-aware business strategies.

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Chronic physical lens

Chronic physical lens refers to slow-onset shifts in everyday environmental factors. Examples include temperature increases, sea-level rises, changes in precipitation patterns and soil quality, change or disturbance of ecological systems, changing operating environment, altered agricultural productivity, changing socio-political environment, health risks and scarcity of resources such as clean water and food.

Mega themes

Changing environmental factors will impact society and the economy via multiple channels.

Complex and potentially dramatic shifts in ecosystems are expected.

Uncertainty over the timing and speed of change.

Exposure

Business operations may be exposed to the changing physical environment via:

- Availability and / or cost of production inputs (eg raw materials, labour, energy, etc)
- Negative impacts on workforce (eg health, safety, absenteeism)
- Changes in availability of productive land
- Supply and distribution chain disruption, changes in demand
- Increased capital costs (eg recurring damage to facilities / physical assets from sea-level rise)
- Rising insurance premiums and potential for reduced availability of insurance on assets in “high-risk” locations

A changing environment could impact the business directly / indirectly through suppliers, competitors or end users:

- Are operations dependent on environmental factors that may change (eg water, weather patterns, arable land, etc)?
- Is the company heavily dependent on natural resources likely to be impacted by climate change?
- How is the company positioned relative to competitors – domestic and global?
- Does the company offer a product that can address or help mitigate the impact of a changing physical environment?
- Are climate change-related public health risks a concern in the company’s key markets?

Management

- Is management thinking about how probable changes in the environment may impact its business? Are they making plans to stay ahead of the curve?
- Does the business have climate-resilient infrastructure in place?
- Is management engaging in research and development aimed at reducing business exposure to the changing environment?

Key value considerations

Risks

- Sea-level rises limit port availability, increase transport costs, interfere with market linkages, make it more difficult to get product to market and thus reduce revenue.
- Assets exposed to chronic physical risk experience rising insurance costs.
- Population health issues reduce fiscal capacity due to increased demand for government goods and services.

Opportunities

- Warmer temperatures cause forests to grow faster thus increasing forestry production and revenue.
- Business lines can be linked to environmental services, environmental rehabilitation or population health services.

Mitigation

- Agricultural research and development investment creates crop strains that will thrive in warmer / wetter / more challenging climate conditions.
- Climate-resilient infrastructure (both greenfield and enhanced value to existing infrastructure) can absorb effects of climate change.
- Appropriate insurance solutions can be adopted by management.

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Acute physical lens

Acute physical lens refers to extreme weather events that may cause damage to investments. These include flooding, fire, strong winds, extreme temperatures, extreme precipitation events, supply chain disruption and volatility of key commodity prices.

Mega themes

The incidence and severity of extreme weather events is expected to increase as the world warms.

Exposure

Companies may be exposed to the impact of extreme weather events via:

- Physical assets (eg land, processing and storage facilities, offices, etc)
- Availability and / or cost of production inputs (eg raw materials, labour, energy, etc)
- Operations
- Supply and distribution chains
- Changes in demand

These events could impact the company directly or indirectly through key suppliers or end users:

- Does the company have physical assets in locations vulnerable to severe weather events?
- Is the company reliant on transport links or production inputs sourced from locations vulnerable to severe weather events?
- Does the company have a concentrated exposure to particular suppliers / end users vulnerable to extreme weather events?
- Does the company offer a product that can address / mitigate either the acute risk or the damage caused?

Management

- Does management have an appropriate business continuity plan in place?

Key value considerations

Risks

- Weather events disrupt the supply chain and increase costs.
- More frequent and unpredictable extreme weather events cause insurance costs to increase.
- Food sources, infrastructure and property are destroyed by extreme weather events thus increasing costs.

Opportunities

- Company enters a new business line or pursues growth in an existing business line (eg catastrophe insurance).
- Company produces a good or service in higher demand as the result of extreme weather events.

Mitigation

- Management adopts appropriate insurance solutions and has a comprehensive business continuity plan in place.

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APPENDIX 2: EXTERNAL DATA PROVIDERS

Various external data providers are beginning to summarize and disclose climate change risk-related data about physical and transition risks and opportunities primarily for publicly listed entities and for the industries most impacted by climate change. These data providers may give insight into specific and identifiable risks and opportunities faced by the subject and the broader industries and geographies, which may be relevant to the valuation. However, climate change risk assessment and data disclosures are still nascent, and accordingly there are limitations in the quality, usefulness and comparability of data and risk assessments. In addition, not all climate change risk data is focused on valuation.

Data providers relevant for assessing and identifying climate-related risks for valuers and other users of this guidance include the following parties, among others:

- **Bloomberg**
- **The Climate Service**
- **Four Twenty Seven**
- **MSCI**
- **Trucost**



NOTICE TO READER

This guide does not specifically endorse or recommend any specific data provider. Users of this guidance document are encouraged to perform their own research and due diligence related to the quality and usefulness of the information provided by the above or other providers not mentioned here.

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APPENDIX 3: RELEVANCE TO FINANCIAL REPORTING

Recent statements by the International Accounting Standards Board (IASB) and the International Auditing and Assurance Standards Board (IAASB) underline that climate-related risks may already be deemed material factors and should be reflected appropriately in financial statements.

In November 2019, Nick Anderson, an IASB Board member, underlined this view. His IASB In Brief article *IFRS® standards and climate-related disclosures** is intended to help investors understand what already exists in the current International Financial Reporting Standards (IFRS) requirements and guidance. He notes that climate-related risks may be deemed material and warrant disclosures in financial statements under existing standards. Specifically, his opinion underlines that “qualitative external factors, such as the industry in which the company operates, and investor expectations may make such risks ‘material’ and warrant disclosures in the financial statements, regardless of their numerical impact.” His opinion piece reiterated helpful guidance released by the two Australian standard-setting bodies, the AASB and the AuASB 2018, revised in April 2019: **Climate-related and other emerging risks disclosures: assessing financial statement materiality using AASB / IASB Practice Statement 2**. The guidance note specified:

“The potential financial implications arising from climate-related and other emerging risks may include, but are not limited to:

- Asset impairment;
- Changes in the useful life of assets;
- Changes in the fair valuation of assets due to climate-related and emerging risks;
- Increased costs and / or reduced demand for products and services affecting impairment calculations and / or requiring recognition of provisions for onerous contracts;
- Potential provisions and contingent liabilities arising from fines and penalties; and
- Changes in expected credit losses for loans and other financial assets.”

On 1st October 2020, the IAASB issued a Staff Audit Practice Alert to assist auditors in understanding what already exists in the International Standards on Auditing today and how it relates to auditors’ considerations of climate-related risks in an audit of financial statements. In issuing the alert, it underlined that climate change has the potential to impact most, if not all entities, directly or indirectly and is increasingly front of mind for investors and other IAASB stakeholders as its effects are increasingly visible.

The following guidance is targeted at financial statement auditors, but also provides a practical starting point to help valuers respond.

IAASB: The Consideration of Climate-Related Risks in an Audit of Financial Statement

*IFRS Standards and climate-related disclosures, IASB In Brief article from Nick Anderson, IASB Board Member, November 2019:
<https://cdn.ifrs.org/-/media/feature/news/2019/november/in-brief-climate-change-nick-anderson.pdf?la=en>

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APPENDIX 4: METRICS RECOMMENDED IN THE TCFD GUIDANCE AND POSSIBLE SOURCES

Given the range of reporting frameworks it is important to understand where climate-related risk and opportunity data may already be reported by organizations.

The list of metrics recommended within the TCFD sectoral guidance is summarized in the table to the right developed as part of the Corporate Reporting Dialogue Better Alignment Project. The table lists each metric with its relevant sector(s) listed in brackets below, and the extent to which that information can be sourced from reporting using CDP, GRI and SASB.

Estimated Scope (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Vehicle Sales (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	GHG Emissions (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Mechanical Emissions (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Fuel Consumption (Transportation) CDP-SASB: Substantive difference, GRI: Reasonable, SASB: Reasonable
Revenues (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	EEDI (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Area of Buildings (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Average Carbon (Financial Services) CDP: Full, GRI: Reasonable, SASB: Reasonable	Life Cycle (Transportation) SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Proportion (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Expenditures (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Reserve Breakdown (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Absolute Carbon Emissions (Financial Services) CDP: Full, GRI: Reasonable, SASB: Reasonable	Expenditures (Materials and Buildings) CDP-GRI, CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Gross Amount (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Road Vehicles (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Percentage Certified (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Portfolio Carbon Emissions (Financial Services) CDP: Full, GRI: Reasonable, SASB: Reasonable	Energy Intensity (Materials and Buildings) CDP-GRI, CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Indicative Costs (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Investment (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Revenues (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Volume of Portfolio Carbon (Financial Services) CDP: Full, GRI: Reasonable, SASB: Reasonable	Fresh Water Percentage (Materials and Buildings) CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Assets (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Revenues (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Water Withdrawn (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	GHG Emissions (All) CDP-SASB, GRI-SASB, SASB-CDP, SASB-GRI: Substantive difference, GRI: Reasonable, SASB: Reasonable	Investment (Materials and Buildings) CDP-GRI, CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Reserves Breakdown (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Energy Consumption (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Water Percentage (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Carbon Prices (Energy) SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable	Expenditures (Agriculture, Food and Forest Products) CDP-GRI, GRI-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Capital Payback (Energy) CDP: Full, GRI: Reasonable, SASB: Reasonable	Fuel Consumption (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Assets (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Expenditure Low Carbon (Energy) CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable	Purchased Energy (Agriculture, Food and Forest Products) CDP-SASB, SASB-CDP, SASB-GRI: Substantive difference, GRI: Reasonable, SASB: Reasonable
Average Fleet Fuel (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Building (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Non-mechanical Emissions (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Percentage of Water (Energy) CDP-SASB, SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable	Investment (Agriculture, Food and Forest Products) CDP-GRI, GRI-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable
Revenues (Transportation) CDP: Full, GRI: Reasonable, SASB: Reasonable	Water Intensity (Materials and Buildings) CDP: Full, GRI: Reasonable, SASB: Reasonable	Land Use (Agriculture, Food and Forest Products) CDP: Full, GRI: Reasonable, SASB: Reasonable	Investments (Energy) SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable	Percentage Carbon (Financial Services) SASB-CDP: Substantive difference, GRI: Reasonable, SASB: Reasonable

Legend - Alignment to TCFD



Legend - Mapping between frameworks



Alignment with the TCFD illustrative example metrics, and between CDP, GRI and SASB
 For each of the 50 TCFD illustrative example metrics, the figure shows the level of alignment (i.e. full, reasonable, moderate, very limited or no alignment) with the relevant indicator(s) of each of the three participants, as indicated by the colouring of the CDP, GRI and SASB boxes. The figure also shows the level of alignment between the three participants' relevant indicators. Where there is substantive difference it is shaded pink and the nature of that difference is indicated, i.e. SASB-CDP denotes that information collected by the SASB indicator is not applicable for reporting with CDP's framework. The name of each of the 50 TCFD illustrative example metrics is given in bold with the applicable sectors indicated in brackets.

Source: The Corporate Reporting Dialogue: Better Alignment Project

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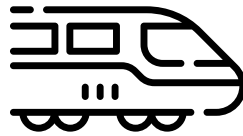
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CASE STUDIES

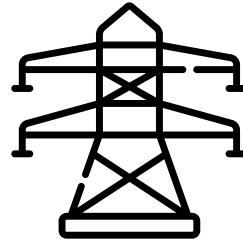
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CASE STUDIES

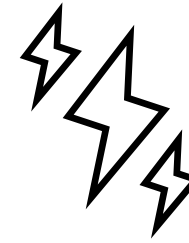
The following case studies act as additional resources for using the framework:



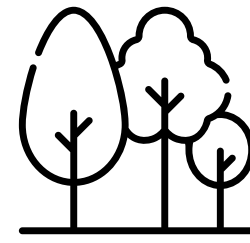
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WYZ Transmission



Candor Energy



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NOTICE TO READER

All names, data and other information may be loosely based on actual companies, geographies and situations, but have been substantially obscured for the purposes of these case studies. No descriptions, facts, circumstances or climate-risk assessments are meant to be taken as wholly factual, but rather are intended to provide an example of the potential application of the proposed guidance / framework to a private company valuation.

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CASE STUDY – RAILCO INC.



A POTENTIAL NEW INVESTMENT

- RailCo is a leading provider of maintenance-of-way (MOW) equipment, aftermarket parts and services to the railroad industry in North America. The company's equipment is used in the construction, maintenance and repair of railroad tracks throughout North America.
- RailCo is also the largest independent provider of aftermarket services to the MOW equipment sector. MOW equipment typically endures very heavy use and requires significant repairs, rebuilds and overhauls over its useful life.
- RailCo primarily serves the needs of Class 1 railroads¹ and enjoys long-term relationships with its major Class 1 rail customers. Class 1 railroads tend to prioritize MOW expenditures highest among their capex budgets – ahead of track expansion and rolling stock investment.

¹ In the United States, the Surface Transportation Board defines a Class 1 railroad as "having annual carrier operating revenues of US\$250 million or more in 1991 dollars."

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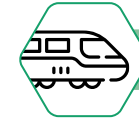
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RailCo

IDENTIFY



Identify the company’s value drivers

MOW spend – driven by:

Gross ton miles

- Railroad infrastructure deteriorates with increased usage.
- Railroad freight shipments as measured in gross ton miles (GTMs) stimulate investment in MOW capex (for new equipment) and opex (for repair, parts and rebuilds as a result of wear and tear).

Class 1 profitability

- Profitability influences the ability of Class 1 railroads to fund MOW investment.
- Coal shipped to electrical power generation plants made up 14% of Class 1 tonnage carried and 12.7% of revenue in 2019.¹ About 70% of American coal is shipped by rail.

Track capacity

- Investment in additional track capacity by Class 1s drives increased MOW expenditure.
- Several of the major high-density corridors are operating at “above capacity” levels.

Worker safety / productivity

- Increasing focus is being placed on worker safety and productivity of maintenance crews.
- Class 1s have turned to MOW equipment to mechanize these activities, improve crew productivity and ensure a higher and more consistent quality standard.

Long-standing relationships with Class 1 railroads

¹ Association of American Railroads <https://www.aar.org/wp-content/uploads/2020/07/AAR-Coal-Fact-Sheet.pdf>

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ASSESS



Assess climate change risk and opportunities

The following sources of information were considered when identifying the climate change risks and opportunities to which RailCo is exposed.

Discussions with management

Management of RailCo highlighted three primary areas of risk and opportunity related to climate change:

- 1. Opportunity:** Rising temperatures (acute physical risk).
- 2. Opportunity:** Extreme weather costs (extreme physical).
- 3. Risk:** Class 1 railway exposure to coal (market transition).

Subject company annual and sustainability reporting

RailCo has not prepared any sustainability reporting. Very limited commentary on climate change risks and opportunities is included in the management discussion and analysis sections of its annual report.

Comparable company annual and sustainability reporting

Only limited comparability to other publicly traded companies (ie rail services only account for a small proportion of the overall business).

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ASSESS



Assess climate change risks and opportunities

The following sources of information were considered when identifying the climate change risks and opportunities to which RailCo is exposed.

SASB materiality map

- The Sustainability Accounting Standards Board Materiality Map does not identify any significant environmental risks related to the Industrial Machinery and Goods sector that would be applicable to RailCo but does highlight "Energy Management".
- Risks related to the Rail Transportation sector include emissions, air quality and employee health and safety. Although unrelated to climate change, the latter may present an opportunity for RailCo as more activities are mechanized to avoid employee injury.

Equity analyst report

Equity analysts highlight the pace of the ongoing decline in coal use for electric power generation and consequently in production and volumes transported. Declining shipments present a key risk to the Class 1 railroads that would adversely influence gross ton miles (GTMs) and ultimately MOW expenditures.

External data providers

Research and data are available from various external sources that assesses the impact of extreme weather risk and rising temperatures on railroad operations.

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ASSESS



Assess climate change risks and opportunities

The following table summarizes the sources of information considered when identifying the climate change risks and opportunities to which RailCo is exposed.

Risk and opportunity identification sourception

Risks and Opportunities	Management	Subject company reporting ¹	Comparable company reporting ²	SASB materiality map	Equity analyst reports	External data providers
Opportunity: Rising temperatures	✓					✓
Opportunity: Extreme weather events	✓				✓	✓
Risk: Class 1 exposure to coal	✓				✓	

¹ RailCo has not prepared any sustainability reporting; very limited commentary on climate change risks and opportunities included in the management discussion and analysis sections of its annual report.

² RailCo has only very limited comparability to other publicly traded companies (ie rail services account for only a small proportion of the overall business).

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ASSESS



Physical risks and opportunities – background

Chronic opportunity: Rising temperatures

- Climate change projections forecast rising global temperatures and a likely increase in the number / severity of heat-related events.
- Tracks are designed to operate effectively within relatively narrow temperate ranges. Temperatures that exceed this range cause “sun kinks” or degradation (ie buckling, warp or misalignment) that can lead to derailment if undetected.
- Track maintenance is a precautionary measure to reduce the likelihood of track buckles and degradation owing to sustained high temperatures. This presents an opportunity for RailCo through increased demand for MOW equipment and repair / maintenance activities.
- Over the longer term, development of new rail materials to minimize degradation at high temperatures could potentially limit some of this opportunity.

Acute opportunity: Extreme weather events

- Climate change projections forecast a greater frequency of extreme weather events.
- Railroad infrastructure is particularly vulnerable to damage from sudden or unforeseen changes in weather and from potential increases in the intensity and / or frequency of extreme weather events such as storms, tornadoes, tropical cyclones, avalanches, extreme heat / cold, flooding etc all influenced by climate change.
- Track repair and maintenance or rail testing requirements resulting from extreme weather events present an opportunity for RailCo through increased demand for MOW equipment and repair / maintenance activities.

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Transition risks and opportunities – background

Market risk: Class 1 exposure to coal

- Revenue growth across Class 1 railroads is driven by growth in GDP and the consequent increase in tonnage shipped by rail. The transportation of coal made up 14% of originated tonnage¹, the highest volume of any commodity carried by Class 1 railroads in 2019 but is subject to an ongoing transition away from the use of coal for electrical power generation as more nuclear, gas and “clean” plants come online.
- The United States has the second-highest installed capacity of coal power plants worldwide as of January 2020².
- 2019 marked the highest level of annual coal capacity retirements in the US since 2015.³ Already 13 plant closures have been announced in 2020. In 2019 there were 241 coal powered units across the United States.
- The shift away from coal-fired power plants to natural gas and renewable energy presents a transition risk not only to the Class 1 railroads, but also to downstream supply chains such as RailCo. If declining coal tonnage is not replaced by alternative freight, the profitability and / or the need for MOW equipment or repair / maintenance activities will be at risk of decline.

¹ Association of American Railroads <https://www.aar.org/wp-content/uploads/2020/07/AAR-Coal-Fact-Sheet.pdf>

² Source: Statista 2020

³ Source: Standard and Poor's Global Market Intelligence

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FILTER



Determine likelihood and impact of identified risks / opportunities

Physical risks:

Risk / opportunity	Mitigating considerations	Likelihood	Impact
<p>Chronic opportunity Rising temperatures: Climate change projections forecast rising global temperatures and a probable increase in the number / severity of heat-related events impacting railroads.</p>	<p>Over the longer term, technological developments could potentially limit some of this opportunity if rail materials are upgraded to minimize degradation under high temperatures.</p> <p>Some of the opportunity may be absorbed by the railroads ways to the extent they have excess MOW equipment or in-house service capabilities.</p>	● Moderate	● Moderate
<p>Acute opportunity Extreme weather events: Climate change projections forecast a rising occurrence of extreme weather events such as storms, tornadoes, tropical cyclones, avalanches, extreme heat / cold, flooding etc.</p>	<p>Some of the opportunity may be absorbed by the railroads to the extent they have excess MOW equipment or in-house service capabilities.</p>	● High	● Moderate

In general, physical climate change risks present opportunities for RailCo through the potential need for more MOW equipment and repair / maintenance activities.

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FILTER



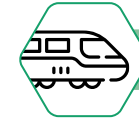
Determine likelihood and impact of identified risks / opportunities

Physical risks

Risk / opportunity	Mitigating considerations	Likelihood	Impact
<p>Market risk</p> <p>Railroad exposure to coal volumes: Transportation of coal accounts for 30.1% of originated tonnage for all US railroads and 14% for Class 1 railroads but is likely to continue declining in volume as electrical power generation plants move to nuclear, gas and renewable energy sources. Class 1 railroad GTMs / profitability are likely to be impacted with downstream implications for demand for MOW equipment / repairs.</p>	<p>There is potential for coal tonnage to be replaced by alternative freight opportunities given cost effectiveness of rail transport.</p>	<p>● Very high</p>	<p>● High</p>

The trend away from the use of coal for electric power generation is driven by the need to reduce GHG emissions. This trend plus improvements in technology (eg fracking) and cost reductions for renewable / alternative energy sources increases the market risk assessment.

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INTEGRATE



Integrate climate-risk assessment into the valuation

VALUATION METHODOLOGY

Primary valuation approach: Discounted cash flow

Given the availability of financial forecasts from management and the expected profitability of RailCo, a going concern income approach using the discounted cash flow methodology was applied as the primary approach in valuing RailCo. This approach also allows specific climate change adjustments that can be quantified to be included in the cash flow forecasts.

Secondary valuation approach: Comparable-company market approach

The comparable-company market approach was considered a corroborative approach when assessing the reasonableness of the EV / EBITDA multiple implied by the DCF analysis.

INTEGRATE





Discounted cash flow valuation

The inclusion of risk or opportunity in the discount rate or cash flow is impacted by the ability to quantify the cash flow impact, the reliability of estimates used to perform the quantification, and the certainty with which they will impact the business.

Generally, as the quantifiability, reliability and certainty of risks and opportunities increase, it is preferable to include them in the cash flows rather than in the discount rate.

Physical risks:

Risk / opportunity	Risk rating	Cash flow / discount rate considerations	Conclusion
Physical chronic opportunity Rising temperatures	 Moderate	Cash flow impacts <ul style="list-style-type: none"> It is inherently difficult to reliably estimate the potential impact of rising temperatures on the future cash flows of the business. Discount rate impacts <ul style="list-style-type: none"> Because of the lack of reliable cash flow estimates, the opportunities created by rising temperatures (ie potential for higher demand for MOW equipment or machinery repair and parts) are better captured in the discount rate. To the extent there is improved future visibility around this opportunity, the cash flows should be modified accordingly. 	Consider in discount rate
Physical acute opportunity Extreme weather events	 High	Cash flow impacts <ul style="list-style-type: none"> It is inherently difficult to reliably estimate the potential impact of extreme weather events on the future cash flows of the business. Discount rate impacts <ul style="list-style-type: none"> Because of the lack of reliable cash flow estimates, the opportunities arising from extreme weather events (ie potential for higher demand for MOW equipment or machinery repair and parts) are better captured in the discount rate. To the extent there is improved future visibility around this opportunity, the cash flows should be modified accordingly. Increasing frequency and severity of extreme weather events as well as heightened risk around the outlook for extreme weather events would lead to an increase in the discount rate. 	Consider in discount rate

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Discounted cash flow valuation

The inclusion of risk or opportunity in the discount rate or cash flow is impacted by the ability to quantify the cash flow impact, the reliability of estimates used to perform the quantification, and the certainty with which they will impact the business.

Generally, as the quantifiability, reliability and certainty of risks and opportunities increase, it is preferable to include them in the cash flows rather than in the discount rate.

Physical risks:

Risk / opportunity	Risk rating	Cash flow / discount rate considerations	Conclusion
Transition market risk Railroad exposure to coal volumes	 Very high	Cash flow impacts <ul style="list-style-type: none"> • A decline in future coal volumes is generally anticipated to adversely impact GTMs. Through discussions with the Class 1 railroad operators and industry research, management has been able to include an estimate as to the impact this may have on future business activities and profitability of RailCo. Discount rate impacts <ul style="list-style-type: none"> • Although management has included an estimate of the potential impact of declining future coal volumes on business activities and profitability, the pace of transition remains uncertain. There is, however, increasing environmental pressure to accelerate the transition; technological advances in renewable energy options and affordability are supporting this trend. Given the increasing focus on environmental factors and growing pressures to retire coal plants, we have also included a risk premium in the discount rate determination. <p>*** Be careful not to double count the risk already reflected in the cash flows.</p>	Consider in both discount rate and cash flows

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Comparable-company market approach

To triangulate the conclusions reached under the discounted cash flow approach, it is prudent to consider the comparable-company market approach where possible. The following tables highlight some of the factors to consider in assessing relative differences between a comparable company and a subject company when selecting an appropriate market multiple.

Company	Sector	Geography	Physical climate assessment	Transition climate assessment
RailCo	Industrial Machinery	North America	● High	● Very high
T Corp	Industrial Machinery	North America	● High	● Moderate

RailCo and T Corp have similar sector and geographic exposure. Neither company has published any industry-specific climate change metrics. The companies exhibit similar physical-risk exposures; however, RailCo faces higher transition risk because of the Class 1 railroad exposure to declining coal volumes.

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INTEGRATE



Comparable-company market approach

The analysis below highlights some of the key considerations applied when adjusting the market multiple observed for T Corp.

Description	Enterprise Value / EBITDA Multiple	Comments
Comparable-company: T Corp	6.0x	Based on EV / EBITDA multiple of T Corp
Adjustments:		
• Company-specific considerations	0.5x	T Corp is more diversified in terms of business lines (ie rail products and services account for about 50% of revenues); but has historically exhibited lower year-over-year growth than RailCo. Multiple adjusted up by 0.5x.
• Industry-specific considerations	0.0x	No adjustment for relative industry-specific factors.
• Physical-risk adjustments	0.0x	No adjustment for relative physical risks because RailCo is assessed as risk neutral on physical risk relative to T Corp.
• Transition-risk adjustments	-1.0x	RailCo has higher transition risk as a result of the decline in the demand for coal among Class 1 railway customers. Multiple adjusted down by 1.0x.
Subject company selected multiple	5.5x	

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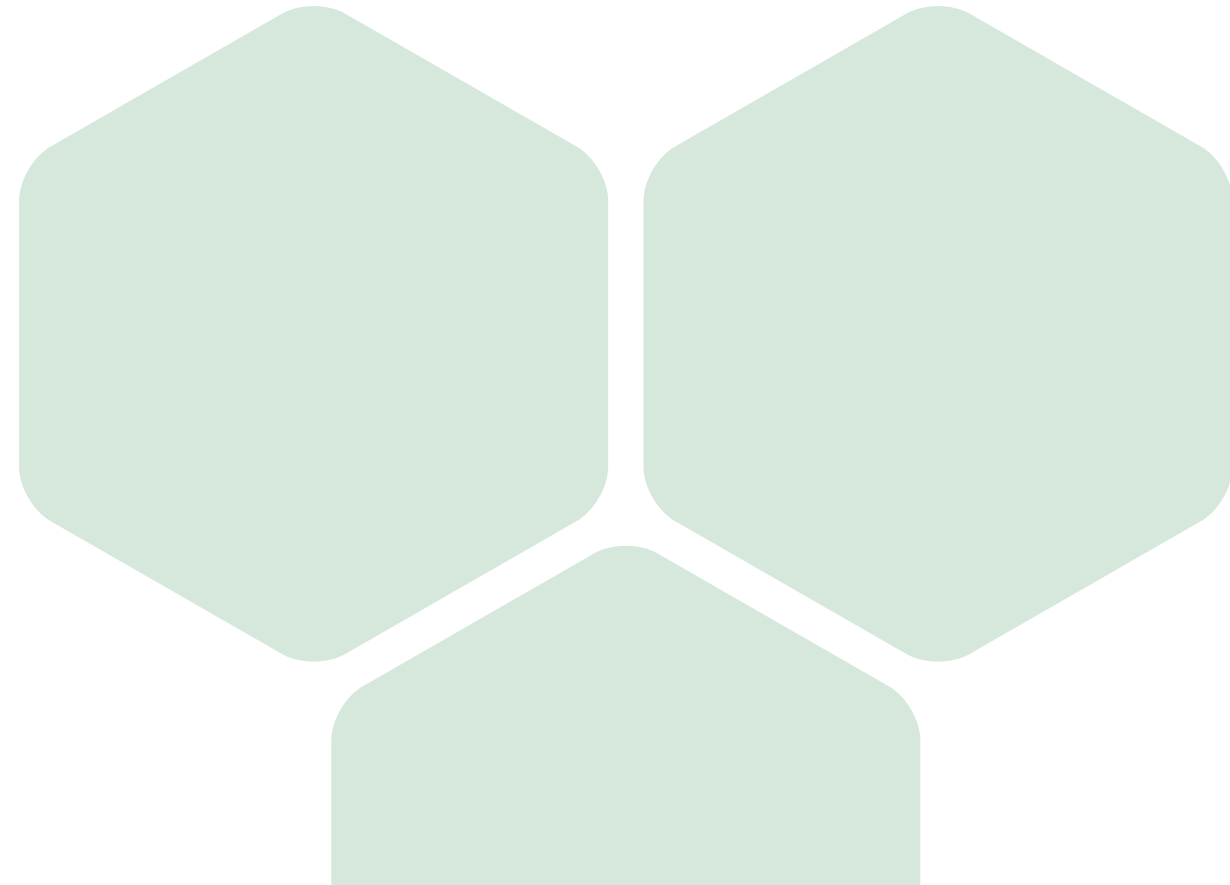


TRIANGULATE



Summary of lessons learned

- Both the discounted cash flow and comparable-company market approaches were used to assess the impact of climate change considerations on the valuation of RailCo.
- Under both approaches, there is still a large element of professional judgement required when assessing adjustments to cash flows / discount rate or comparable-company trading multiples. Accordingly, the ability to triangulate value conclusions under multiple approaches is helpful in assessing the reasonability of the overall conclusion.
- It is important to acknowledge that climate change presents both physical and transition risks and opportunities; both angles should be evaluated when preparing a valuation.



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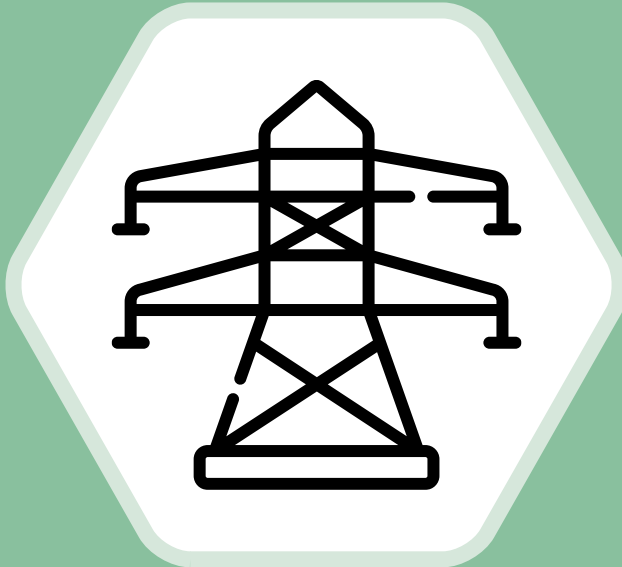
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CASE STUDY – WYZ TRANSMISSION



INVESTMENT OVERVIEW

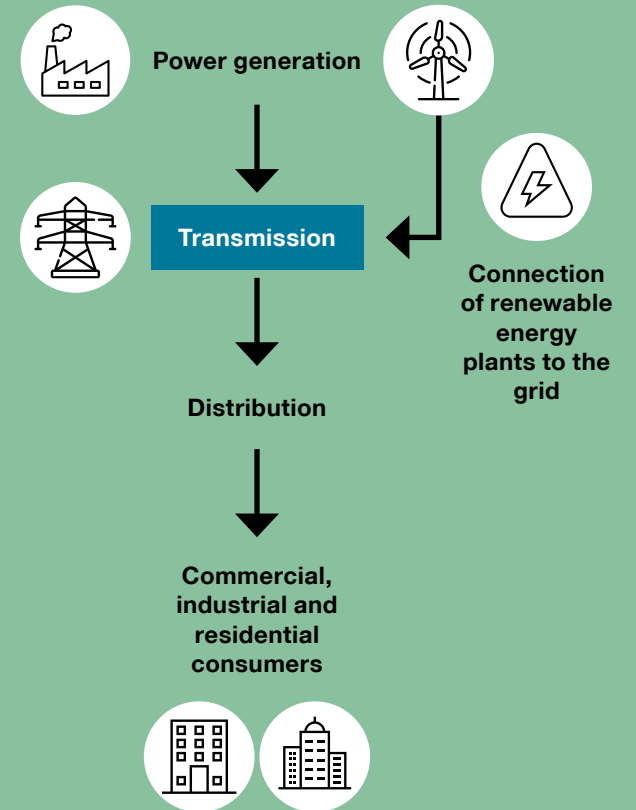
WYZ Transmission has a long history in the electricity transmission sector.

Activities include:

- Transmission of electricity
- Connection of power plants to the grid

WYZ operates in both the regulated and unregulated sectors:

- Regulated: grid operations
- Unregulated: other activities such as the connection of new renewable energy power plants to the grid



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IDENTIFY



Identify the company's value drivers

Core activities

- Electricity transmission to supply distribution networks and major industrial consumers

Operating environment

- Regulated activities: Transmission of electricity produced by large centralized electricity generators
- Unregulated activities: Connecting new renewable energy power plants to the grid and operating / maintaining that connection

Geographies

- State level (regional)

Revenue / costs

Regulated activities

- **Customers:** distribution networks and large industrial consumers
- **Revenue Source:** energy transmission
- Revenue based on regulatory approval to cover approved capex, opex and return on capital

Unregulated activities

- **Customers:** distribution networks and large industrial consumers
- **Revenue source:** transformers and transmission lines to connect new electricity generators to the grid (mostly renewable energy projects)
- Revenue derives from construction services, operations and maintenance and investment return on these infrastructures

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Risk and opportunity identification

The risk and opportunity assessment has been performed based on current conditions observed (ie current regulations and the current trending of GHG emissions) and does not incorporate any scenario analysis. A summary of those risks and opportunities is presented below.

The risks and opportunities were identified from various sources including WYZ Transmission’s annual and sustainability reports, industry analysis and discussions with management.

Physical risks

Type	Risk	Mitigants	Likelihood	Impact
Acute	Droughts and higher temperatures increase risk wildfires could damage infrastructure and disrupt activities. Leading to higher maintenance costs, leading to lower revenue because of disruptions.	Underground systems (already used in some regions) are an alternative.	● Low	● Moderate

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ASSESS



Risk and opportunity identification

The risk and opportunity assessment has been performed based on current conditions observed (ie current regulations and the current trending of GHG emissions) and does not incorporate any scenario analysis. A summary of those risks and opportunities is presented below.

The risks and opportunities were identified from various sources including WYZ Transmission's annual and sustainability reports, industry analysis and discussions with management.

Transition risks

Type	Risk	Mitigants	Likelihood	Impact
Policy	<p>Early closure of traditional power plants because of policy changes</p> <p>Example: Restrictions on traditional sources of energy and / or increased carbon taxes.</p> <p>Leading to increased risk of not meeting the minimum reliability standard leading to lower revenue / lower cost.</p>	Government's priority remains to provide population with reliable source of energy.	● Low	● Moderate
Market	<p>Reduction in demand for energy through transmission network</p> <p>Example: Improved energy efficiency by consumers, commitment by end user to reduce energy consumption, emergence of off-grid living, etc.</p> <p>Leading to lower revenue in the long term.</p>	<p>Revenue is mostly secured by contracts and regulation in the short term.</p> <p>Large-scale renewable energy will remain the lowest-cost energy generation source.</p> <p>Demand for energy in general is expected to increase as a result of growing population and changing lifestyle habits (eg electric vehicles, air conditioning, etc).</p>	● Low	● Low
	<p>Increased supply uncertainty from replacement of ageing thermal plants by intermittent power sources (eg solar and wind) as well as stranded asset risk.</p> <p>Leading to increased risk of not meeting minimum reliability standard leading to lower revenue.</p>	Existing dispatch capacity continues across network as well as the possibility to increase storage capacity (ie capex required).	● High	● High

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ASSESS



Risk and opportunity identification

Transition risks:

Type	Risk	Mitigants	Likelihood	Impact
Technology	Disruptive factor: Emergence of residential solar plant resulting in decreased reliance on transmission network. Leading to lower revenue in the long term.	Revenues are protected by contracts in the short term; large-scale renewable energy will remain the lowest-cost generation source.	● High	● Moderate
Legal and Reputation	Legal action / damage to reputation for being responsible for wildfires. Leading to increased litigation costs and potential fines.	Rigorous mitigation programmes are in place.	● Moderate	● Moderate

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ASSESS



Risk and opportunity identification

Opportunities:

Type	Opportunities	Enablers	Likelihood	Impact
Energy source	Emergence of new renewable energy power plants Leading to increased demand for connecting plants to the grid leading to potential new revenues.	Further develop expertise in connecting renewable energy plants to the grid.	● High	● High
Market	Emergence of off-grid living Leading to diversification opportunities to generate new sources of revenue.	Engage with consumers and adapt business model to involve demand-side participation.	● High	● Low
Resource efficiency	Improved transmission efficiency Leading to lower costs.	Investment in modernising the network. Example: Large-scale energy storage to smooth the intermittency of variable renewable generation.	● High	● High
Products and services	Position company as an industry leader in energy transition Leading to increased potential to grow activities in new geographic and unregulated markets.	Willingness of management to develop innovative but limited solutions to energy efficiency (given competitiveness of industry).	● Moderate	● Moderate

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FILTER



Determine materiality, likelihood and ability to quantify the risk

Insufficient information is available to adjust accurately the discount rate or incorporate risks and opportunities identified into cash flows with the exception of the **opportunity related to the emergence of new renewable energy power plants**. This is due to the fact that specific impacts to the business can be observed and quantified, unlike the other risks and opportunities, which are more unpredictable and uncertain.

Data limitations: Climate change risks and opportunities are not always priced into market transactions.

Valuations can only reflect risks to the extent they are priced into market transactions in order to determine the fair market value as defined by the price that willing and informed buyers would be ready to pay in an open-market transaction.

Opportunity	Current risk rating	Cash flow impacts	Discount rate	Quantification conclusion
Emergence of new renewable energy power plants	● High	Growth of unregulated business segment would directly result in increased cash flows. Since new power plant projects can be identified, specific cash flows can be included in the financial model used for valuation.	Identified project cash flows can be discounted at distinct rates based on their specific level of risk.	Price in both discount rate and cash flows.

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INTEGRATE



Incorporate quantifiable, material impacts into valuation

Step 1:

Adjustments to CASH FLOWS:

Value is added as a result of the integration of renewable power plants into the valuation model.

**Increased cash flows =
increase fair market value**

Step 2:

Adjustments are made to the DISCOUNT RATE:

Uncertainty remains regarding the timing and scope of the additional renewable energy projects reflected in the cash flows and thereby increasing the discount rate.

**Increased discount rate =
decrease fair market value**

Net overall impact of the integration of renewable energy plants in the model = increasing in fair market value

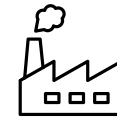
The opportunities arising from the connection of additional renewable energy projects can be incorporated by using a higher discount rate to reflect the uncertainty. However, this exercise cannot be performed for the other risks and opportunities previously identified.

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INTEGRATE



What this means in the valuation calculation?



Regulated activities

Step 1

Determine appropriate cash flow projections based on:

- Regulated asset base
- Allowed rate of return

Step 2

Determine appropriate discount rate based on projections risk:

- Overall low risk given favourable regulatory environment, stable growth perspectives



Unregulated activities

Step 1

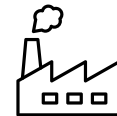
Determine appropriate cash flow projections based on:

- Possible additional revenues from identified renewable energy projects
- Required capex and gearing assumptions
- Negotiated operations and maintenance revenue

Step 2

Determine appropriate discount rate based on projections risk:

- High uncertainty arising from strong growth profile (ie additional leverage and capex required) and reliance on unstable sources of energy



Discount rate used for
regulated activities*

10.0%

No climate change impact on regulated activities



Discount rate used for
unregulated activities*

12.0%

Premium to reflect uncertainty

Net overall impact of the integration of renewable plants in the model = increasing in fair market value

The opportunities arising from the connection of additional renewable energy projects can be incorporated by using a higher discount rate to reflect the uncertainty. However, this exercise cannot be performed for the other risks and opportunities previously identified.

*The discount rates presented above have been chosen to illustrate the theoretical premium considered in valuing unregulated activities and are not reflective of actual discount rates used for the valuation of WYZ Transmission.

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TRIANGULATE



Conclusions and lessons learned

When going through the proposed tool to incorporate climate change into a business valuation, it is **important to always keep in mind what market participants consider.**

- Some of the risks and opportunities identified for WYZ Transmission were not incorporated into the business valuation because **they are not currently priced into market transactions.** However, an investor may view this as an investment or divestment opportunity if they view the risks and opportunities to be mispriced at this time.

Incorporating climate-related risks and opportunities can have a **positive impact on fair market value.***

*Based on IFRS 13 definition of fair market value. Fair value for other purposes may be impacted differently.

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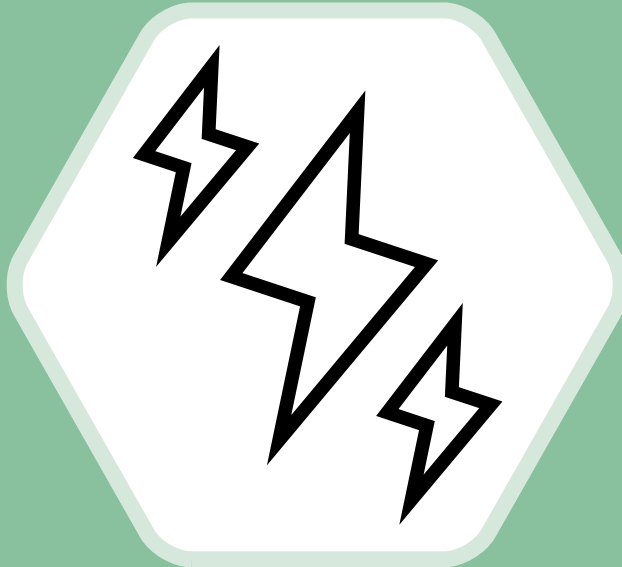
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CASE STUDY – CANDOR ENERGY



INVESTMENT OVERVIEW

- Large portfolio of real estate assets acquired in India
- Portfolio comprised of five Class A, campus-style office properties in key gateway locations
- Tenant base of large, high-quality-credit multinational corporations and financial institutions
- Investment thesis: to maximize income through portfolio lease-up and completion of construction
- Significant follow-on capital invested to upgrade energy infrastructure in the two oldest properties

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IDENTIFY



Identify the company's value drivers

Core activities

- Provide office space and core services to tenants
- Attract and retain high-quality tenants

Cost

- Major costs: Maintenance, energy (ie heating and cooling for the office properties)
- Energy costs passed through to customers
- Potential increased occupancy through better operating efficiency allowing lower net rent
- Opportunity: Replace high-maintenance diesel generators adversely impacting the environment

Revenue

- Leasing revenue earned monthly under long-term contracts
- Objective: Increase leasing revenue and lengthen average term while managing flow-through costs

Geographies

- India

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ASSESS – RISKS AND OPPORTUNITIES



Identify the risks and opportunities

Several opportunities to improve energy usage and efficiency have been identified:

- Energy demands of two properties exceeded grid power
 - The difference (~30% of overall power supply) was made up by diesel generator sets (DG)
- DGs have high maintenance costs, adverse environmental impacts and lower efficiency
 - DG power typically costs 1.5-2x more than grid electricity
- DGs could be overused and the system permanently cease operating
- An energy modernization plan was designed and executed to replace the DGs with grid electricity
- Other energy-efficiency initiatives were completed to diversify the campus's energy supply and further reduce costs

INITIATIVES

- Electricity from the grid replaced DGs
- Substation and transmission upgrades
- Rooftop solar installations
- HVAC system re-engineered
- LED lights installed
- Conventional air filters replaced with electrostatic filters
- Conventional fans replaced with electronically commuted fans
- Chiller efficiency improvements



RESULTS

- Over US\$3.6 million in annual energy-cost savings
- Payback period of 10 months
- CO₂ savings of over 16,000 tons annually
- Significantly improved indoor air quality
- Hedge against exposure to fluctuating oil prices
- Compliance with expected legislation
- Limited potential negative impacts on tenant operations
- Numerous environmental certifications and awards

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FILTER



Risk identification scorecard

Below summarizes the key risks identified.

Risks	Rating	Mitigating Factors
Chronic: Rising temperatures will increase demand for cooling (and increase energy consumption).	Moderate	Yes – See opportunity #1
Acute: Diesel generator is likely more susceptible to damage caused by extreme weather events.	Moderate	Yes – See opportunity #1
Acute: Increasing severity of monsoonal floods and rainy seasons could result in damage to the property.	Moderate	Yes – Insurance programs in place
OVERALL PHYSICAL RISK ASSESSMENT	Moderate	
Policy: Increasing pressure to reduce carbon emissions could result in diesel generators being banned or restricted.	Low	Yes – See opportunity #2
Market: Diesel power is common in parts of India, though multinational tenants are increasingly looking for more sustainable energy.	Low	Yes – See opportunity #3
Technology: Diesel generators are outdated, inefficient, less reliable and more costly to maintain.	Moderate	Yes – See opportunity #1
Reputation: Possible negative impact if prolonged reliance on diesel-generated power or power failure could lead to business interruption risk.	Low	Yes – See opportunity #4
OVERALL TRANSITIONAL RISK ASSESSMENT	Low	

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Opportunity identification scorecard

Below summarizes the key opportunities identified.

Opportunities	Impact
1. Transition away from diesel to the grid (powered increasingly by renewable energy) and solar panels.	● High
2. Reduce carbon emissions by diversifying energy sources, including installing solar panels.	● High
3. Improve indoor air quality by replacing conventional air filters with electrostatic filters and conventional fans replaced with electronic fans.	● Moderate
4. Attract tenants by providing a more sustainable choice than competing properties.	● Moderate

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INTEGRATE



Incorporate quantifiable, material impacts into valuation using scenarios

Below summarizes how the risks and opportunities would impact the valuation of the real estate investment.

Risks	Impact on fair value
Adjustments made to cash flows	
Valuation of base business was derived using a discounted cash flow model and adjusted for the following:	
Opportunities could be captured through the cash flows (eg lower operating costs and potential impact on tenant rents).	↑
Downward adjustments could be made for higher insurance premiums and capital outlays that mitigate larger-scale physical risks.	↓
Adjustments made to the discount rate	
The discount rate (assuming no diesel transformation) was calculated using a pricing model.	↑
The risk premium was lowered to reflect market trading multiples for similar environmentally sustainable real estate in India.	↓

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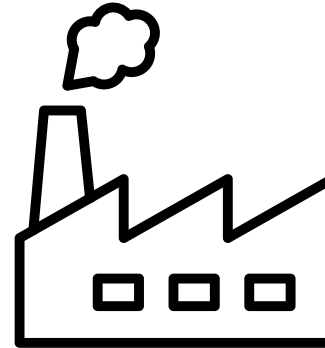
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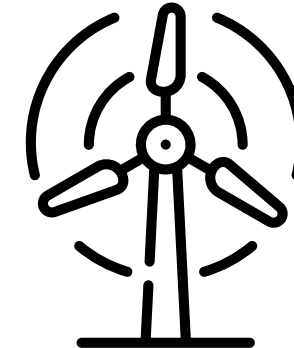
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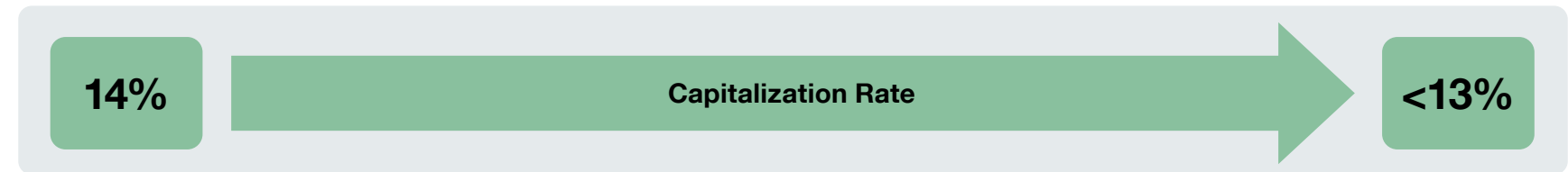
What does this mean for the valuation?



Older less efficient energy sources



Cleaner energy sources



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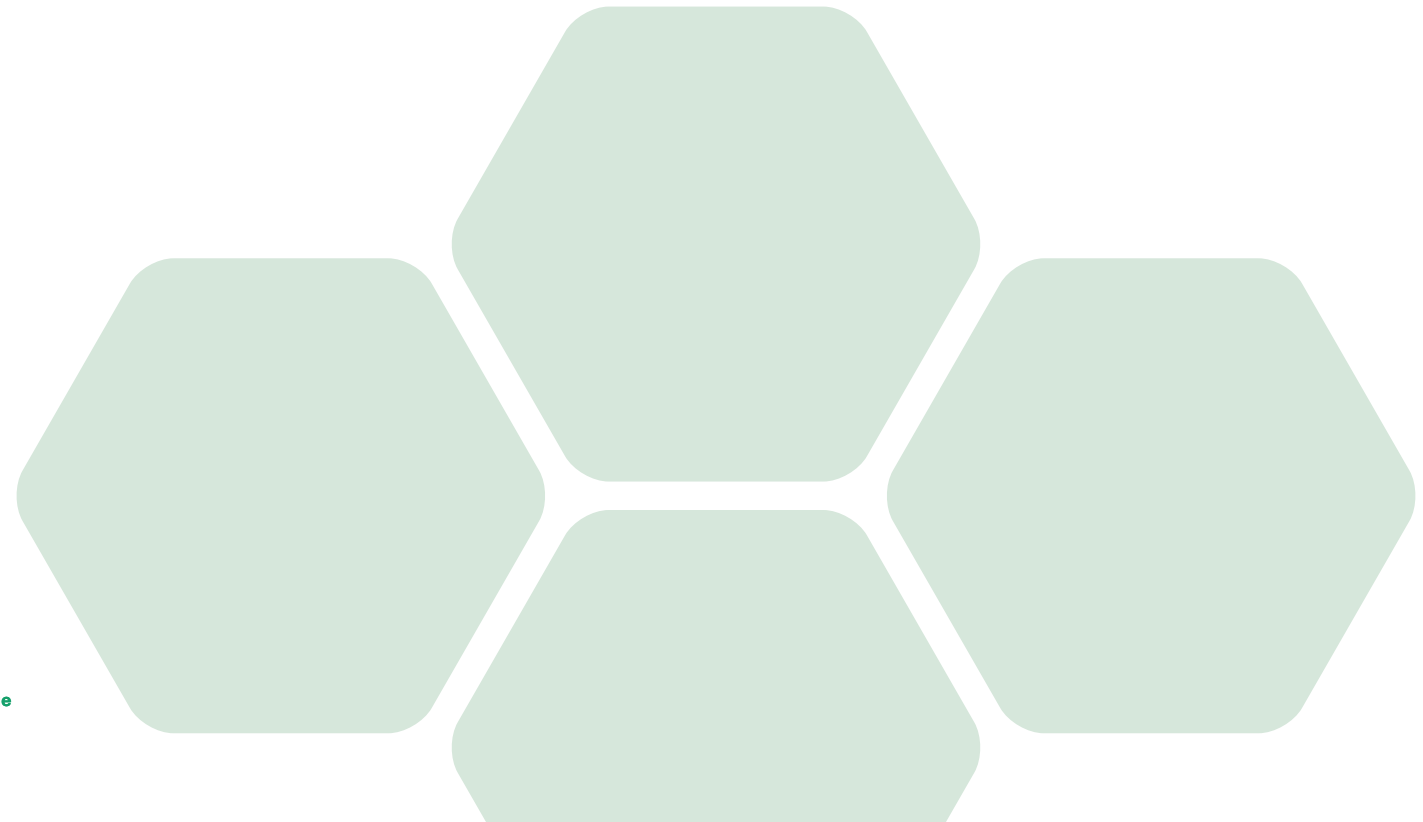


Lessons learned

When comparing asset valuations between companies, it is often difficult to compare climate change risks. The comparison process (as far as it goes) is, nevertheless, extremely useful and can be refined in future valuation periods.

Further considerations and lessons learned:

- Data disclosure is the most important variable in determining climate-related risks for a subject property, as well as its peer set (ie market or transaction comparables).
- It is important to find assets that closely resemble the subject property in order to help isolate physical and transitional risks.
- As data disclosures standardize and improve, valuation analysis will continue to be refined.



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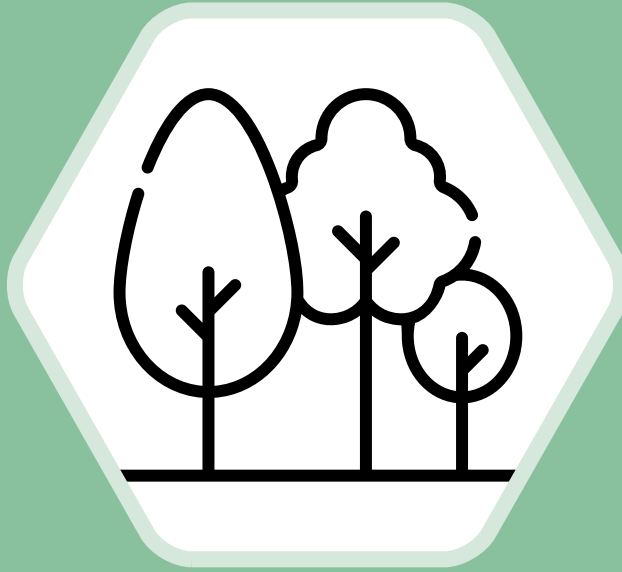
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CASE STUDY – FORESTRY PLANTATION ASSET



A forestry plantation asset, including a large estate of radiata pine on freehold land, a nursery and native forest

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IDENTIFY



Identify the company's value drivers

Core activities

- Trees are grown on freehold land.
- Logs are sold to domestic processors.
- No processing activities are undertaken by the tree crop owner.

Operating environment

- There is a high level of vertical integration in the industry; most big companies are both processors and forest owners.

Revenue / costs

- Most revenue comes from the sale of harvested product to processors of pulp, panels and sawn lumber.
- Costs include labour, harvesting, transport, silviculture¹ and other forest management activities.

Geographies

- Land and trees are located across several regions in a single country.
- Customers (processors) are all domestic and located close to the forest assets.
- Processed product is generally sold to overseas markets.

¹ Silviculture is the practice of controlling the growth, composition / structure, and quality of forests to meet values and needs in timber production.

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ASSESS



Assess climate change risks and mitigating factors

Policy and legal	Technology	Market	Reputation	Acute physical	Chronic physical
<p>Risks</p> <p>Increasing water scarcity leads to re-nationalisation of water rights which, in turn, lead to higher costs for pulp mill customers.</p>				<p>Droughts and higher temperatures increase the risk of fire.</p>	<ul style="list-style-type: none"> • Decrease in rainfall and warmer temperatures increase prevalence of droughts. • Warmer seasons increase the occurrence of pests and diseases. • Worker fatigue in hotter temperatures.
<p>Mitigants</p> <p>Pulp mill customers represent a small proportion by volume and value of total sales.</p>				<ul style="list-style-type: none"> • Non-contiguous forest estate. • Management is prepared through enhanced fire detection and suppression capability. 	<ul style="list-style-type: none"> • Adapt management techniques including species / genotype selection, site selection and silviculture¹ regime. • Well established monitoring and management techniques are needed to control pests and disease. • Fire insurance. • Non-contiguous forest estate. • Mechanisation to protect workers from heat.

¹ Silviculture refers to the practice of controlling the growth, composition / structure, and quality of forests to meet needs in timber production.



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ASSESS



Assess climate change opportunities

Resource efficiency	Energy source	Products and services	Markets	Resilience
<p>Opportunities</p> <p>Warmer temperatures can lengthen the growing season of eucalyptus and radiata pine.</p>			<p>Introduction of an emissions trading scheme (ETS) may result in upside benefit from carbon sequestration.</p> <p>Increased demand for timber can be driven by a policy shift in favour of renewable resources.</p>	
<p>Enablers</p> <p>Improved genetics and management regimes maximize upside.</p>			<p>Government policy focused on reducing emissions.</p>	

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FILTER



Determine materiality, likelihood and ability to quantify the risk

Risk	Important according to SASB materiality map?	Materiality	Likelihood	Impact on valuation	Can be quantified?	Transaction data available?
Increasing water scarcity leads to re-nationalization of water rights which, in turn, leads to higher costs for pulp mill customers.	No This is related to regulatory impacts.	Low Pulp mill customers are only a small proportion of the customer base / revenue.	High There could be significant political pressure from the population to re-nationalise water rights.	Lower revenue for pulpwood material.	Yes But materiality is low.	No
Droughts and higher temperatures increase the risk of fire.	Yes This is related to the physical impacts of climate change.	Moderate / high This can be material if fire destroys or damages a significant area of the forest.	High This depends on the climate change trajectory; however, number of fires increased in the last decade.	Higher insurance and fire management costs / lost tree stocks occur where insurance is not available.	Yes This can be integrated into the valuation.	No
Decrease in rainfall and warmer temperatures increases prevalence of droughts.	Yes This is related to the physical impacts of climate change.	Low Radiata pine is reasonably drought tolerant.	High This depends on the climate change trajectory; however rainfall changes were already evident in the last decade.	Lower harvest yields will lower revenue.	No There is not enough information at this stage.	No

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FILTER



Determine materiality, likelihood and ability to quantify the risk

Risk	Important according to SASB materiality map?	Materiality	Likelihood	Impact on valuation	Can be quantified?	Transaction data available?
Warmer seasons increase the occurrence of pests and diseases.	Yes This is related to the physical impacts of climate change.	Moderate / high Moderate / High if not managed effectively. There are well established monitoring and management techniques for pests and diseases already in place (and costed as BAU) to make the residual risk low.	Moderate This depends on the climate change trajectory; however, increase in pests and disease was present in the last decade in some countries.	Silviculture / pest and disease management costs are higher. (Note: These represent a small cost as a percentage of revenue).	Yes But materiality is low.	No

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FILTER



Determine materiality, likelihood and ability to quantify the risk

Risk	Important according to SASB materiality map?	Materiality	Likelihood	Impact on valuation	Can be quantified?	Transaction data available?
Introduction of an ETS system may result in upside benefit from carbon sequestration .	No This is related to regulatory impacts.	Low Carbon-credit income would likely be immaterial relative to other income streams.	Moderate The country has committed to introducing an ETS scheme, but its form and timing are unclear.	Higher revenue	No There is not enough information at this stage and materiality is low.	No
Increased demand for timber is driven by a policy shift in favour of renewable resources.	No This is related to new market opportunities.	Moderate This could unlock new markets and increase adoption of timber in some industries.	Moderate Most policies in favour of renewable resources are currently focused on the energy sector.	Higher revenue	No There is not enough information at this stage.	No
Warmer temperatures can lengthen the growing season of eucalyptus and radiata pine.	Yes This is related to the physical impacts of climate change.	Low Temperature changes will vary across the estate; the valuation impact will be evident in the medium / long term.	High This depends on the climate change trajectory; however, temperature changes were already evident in the last decade.	Faster rotations bring forward future harvest revenues.	No There is not enough information at this stage.	No

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INTEGRATE



Incorporate quantifiable, material impacts into valuation using scenarios*

Description	Low case	Base case	High case
Global temperature rise	1.5°C-2°C by 2050 Unchanged by 2100	2°C by 2050 3°C by 2100	2°C by 2050 4°C by 2100
Carbon price	Significantly higher than current price	Higher than current prices	Not much higher than current prices
Fossil fuel usage	40% lower in 2050 (vs. 2010)	25% lower in 2050 (vs. 2010)	15% lower in 2050 (vs. 2010)
Impact of increased fire risk from higher temperatures and droughts	LOW Fire insurance and fire management costs increase at slightly above the pace of inflation over the life of the investment. As a result, these costs are higher by the time exited, but the quantum is not significant. Impact on valuation is low .	MODERATE Fire insurance and management costs increase significantly above inflation for the first 10 years of the investment. From year 10 onward, these costs increase at the rate of inflation. As a result, these costs double by the time the investment is exited. Impact on valuation is moderate .	HIGH Fire insurance is prohibitively expensive and management costs significantly above inflation over the life of the investment. As a result, fire risk will likely have to be self-insured. More work is required to estimate a reasonable “fire loss” assumption. The impact on valuation is potentially high .

Base case reflects the way climate change is most likely to play out based on the information currently available.

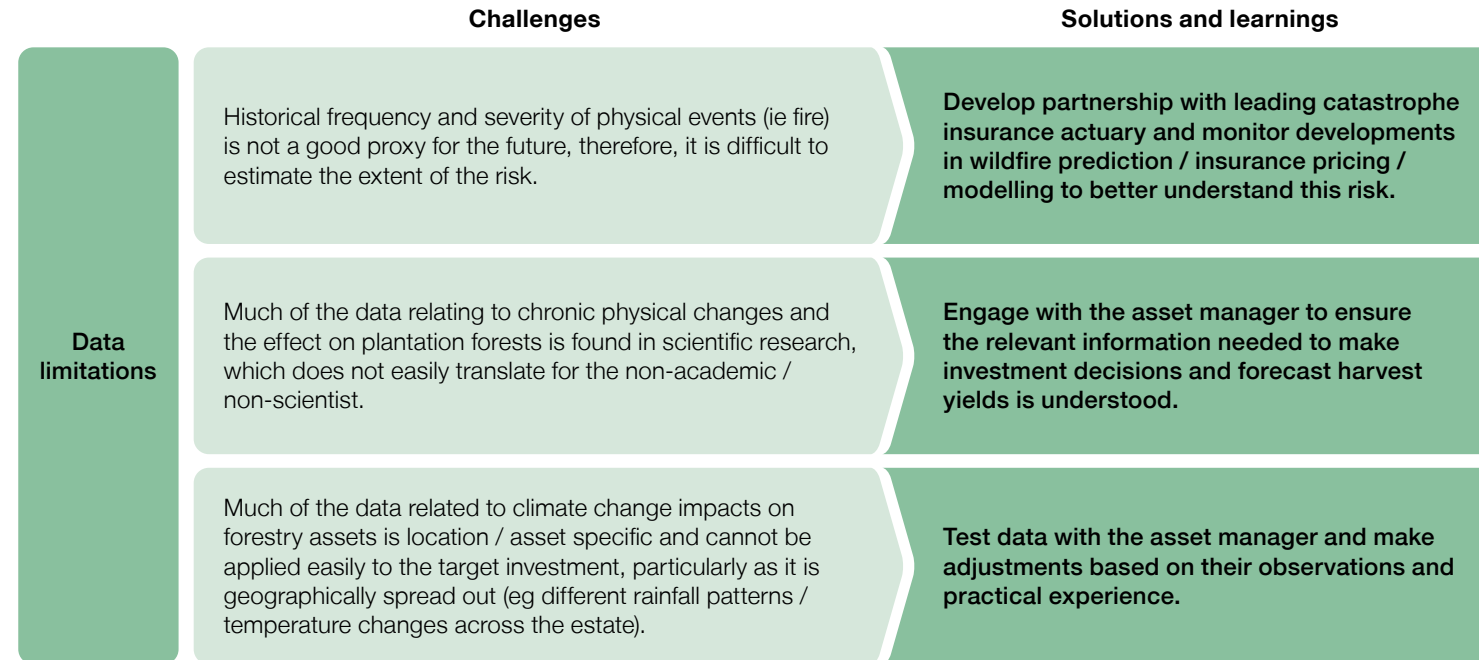
*<https://www.tcfhub.org/scenario-analysis>

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INTEGRATE

Valuation challenges and learnings – What have we learned in the process?



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TRIANGULATE



Test adjustments and monitor company strategy around climate change

What factors will we monitor?

- Research the effect on radiata pine growth rates of various changes in chronic physical conditions.
- For fire insurance premiums and fire management practices, track developments in how insurance actuaries approach modelling of fire risk in the region.
- Study regulatory developments regarding ETS / water rights / other climate-related reforms.
- Record physical conditions across the estate (rainfall, temperature, bugs / disease, etc).
- Track global market demand and technological developments that enable the non-traditional uses of wood fibre.

What factors will we monitor?

Proactively engage with asset manager to:

- Better understand asset climate change risks and opportunities**
How are the asset managers mitigating the risks and / or positioning for the opportunities? Are there any other emerging risks or opportunities that should be monitored?
- Develop a climate change framework**
Although the asset manager monitors climate patterns on an ongoing basis, there is no formal climate change framework in place. Work with them to develop appropriate reporting to track climate change risks and opportunities over time.

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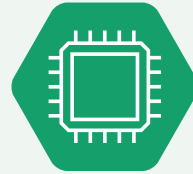
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ANNEX - APPLICATION OF THE LENSES TO FORESTRY PLANTATION



Policy and legal

- Increased costs and complexity for business from policy and regulations designed to limit long-term effects of climate change and to encourage sustainable business operation.
- Impacts that could occur if parties suffered loss or damage from the effects of climate change.



Technology

- Disruption driven by development of technology to support a low-carbon economy.



Market

- Changes in economic and social factors affecting demand and supply.
- Slow onset shifts in everyday environmental factors can affect resource availability.



Reputation

- Profitability loss because the business is causing negative climate change impacts and there is lack of proactive action to address these impacts.



Acute

- Extreme weather: Extreme heat and cold, precipitation, wind gusts, tropical cyclones.



Chronic

- Climate trends: Coastal flooding, fluvial flooding, wildfires.

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- Candor Energy
- Forestry Plantation Asset



ANNEX - APPLICATION OF THE LENSES TO FORESTRY PLANTATION



Resource efficiency

- Improving efficiency across the production and distribution processes, buildings, machinery and transport to reduce emissions effects of climate change.



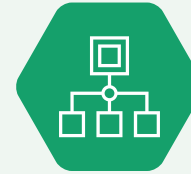
Energy source

- Reducing climate change impact by transitioning to low-emission alternatives such as wind, solar, wave, tidal, geothermal, biofuels and carbon capture and storage.



Products / services

- Developing new low-emission products and services. This might improve competitive position and capitalize on consumer preferences.



Markets

- Seeking opportunities to access new markets by collaborating with governments, banks, etc as they work to shift to a lower-carbon economy.



Resilience

- Developing adaptive capacity to respond to climate change and better manage the associated risks and seize opportunities.

THE A4S CFO LEADERSHIP NETWORK

The Prince's Accounting for Sustainability Project (A4S)

was established by HRH The Prince of Wales in 2004 to convene senior leaders in the finance, accounting and investor communities to catalyse a fundamental shift towards resilient business models and a sustainable economy.

A4S has partnered with Chartered Professional Accountants of Canada (CPA Canada) to run the Canadian Chapter of the A4S CFO Leadership Network. CPA Canada is one of the largest accounting bodies in the world, with more than 220,000 members in Canada and internationally. CPA Canada has a long track record of driving awareness of sustainability issues and supporting its members to deliver on that key role.

The Network has worked on a number of projects including this guidance. The outputs from the other projects are available from the A4S website www.accountingforsustainability.org

Our project team would value feedback on this guide from other organizations working in this area. Please send any comments to: info@a4s.org

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